TECHNOLOGY

Devoted to
TEXTILE
CHEMISTRY
BLEACHING
DYEING
PRINTING
FINISHING

EPTEMBER 13, 1943
OLUME 32, No. 19

AMERICAN DYESTUFF REPORTER

OFFICIAL PUBLICATION
of the
PROCEEDINGS
MERICAN ASSOCIATION
F TEXTILE CHEMISTS
AND COLORISTS

COLOR AT WORK AND AT PLAY

She's a war worker during the day, but she's a soldier's sweetheart in the evening. And women war workers everywhere are learning that fabrics with quality dyes can take the beatings of repeated *hard* launderings, yet come through bright, serviceable, appealing.

So, that's the kind of fast-color performance they expect in all the merchandise they buy.

The way to protect your present markets—build toward expanded markets tomorrow—is to use the highest quality dyes you can get—vat dyes where they can be used and whenever Uncle Sam can spare them. E. I. du Pont de Nemours & Co. (Inc.), Organic Chemicals Dept., Dyestuffs Div., Wilmington, Delaware.

BACK THE ATTACK WITH WAR BONDS

DU PONT DYESTUFFS
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Approved for Mildewproofing of Sandbags!

NOROT CF

COPPER AMMONIUM FLUORIDE

The Corps of Engineers, U. S. Army has approved NOROT CF to meet Tentative Specification T-1452A for the mildewproofing of sandbags.

WARWICK

CHEMICAL COMPANY

West Warwick, R. I.

500 FIFTH AVE., NEW YORK · ROCK HILL, S. C.

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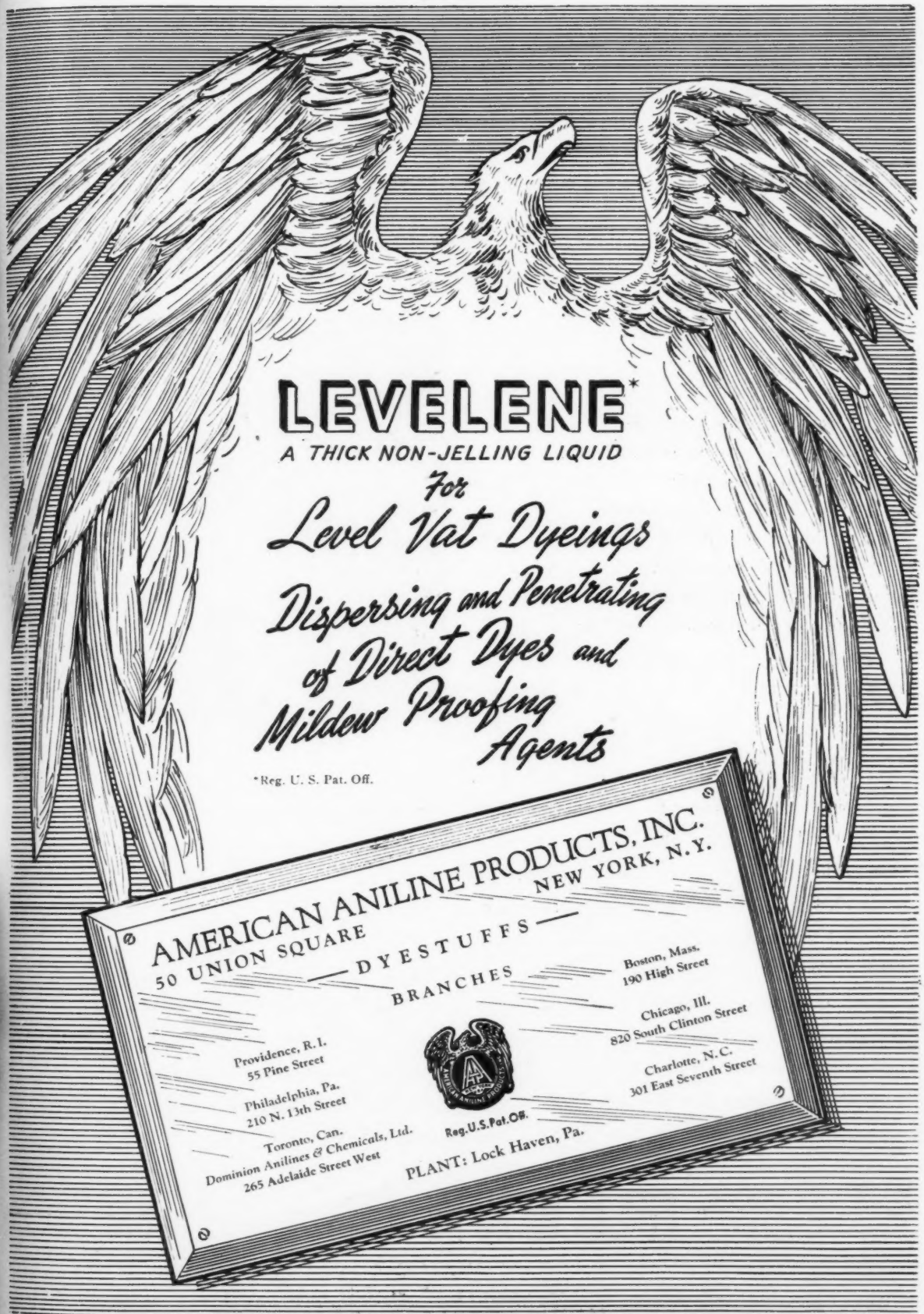

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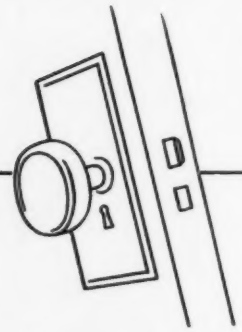
We've An Open Door For Open Minds



Manufacturers...Designers...Technicians... Sales Executives and others now giving thought to economical production of Tomorrow's new and better products, are invited to investigate the unique facilities of the Magna Manufacturing Company for the practical disintegration of materials heretofore unavailable in powder form.

TRACER BULLETS, parachute flares, illuminating signals require powdered magnesium...and plenty of it! To reduce this difficult and extremely hazardous metal to a uniform dust in compliance with rigid U. S. Army and Navy standards, Magna developed special machinery and precision processes.

Today in three great Magna Plants... the largest and most modern facilities of their kind ...we are carrying on this vital wartime job. But Tomorrow...

The facilities that Magna perfected have a far-reaching importance . . . opening vast new possibilities for the utilization not only of magnesium but also all other types of disintegration-resisting metals and other materials such as ceramics, plastics and pigments.

AN INVITATION...

Magna capacities today are entirely occupied with production for Victory. However, Magna engineers are prepared to consult with forward-looking industries on ways and means to utilize powdered metals and other materials in postwar product developments.

MAGNA ARMY E NAVY

MANUFACTURING COMPANY, INC.

MANUFACTURERS OF *Magnaflake* METAL POWDERS

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ONYX

FOR BETTER LOOKING—BETTER WEARING FABRICS

OFFICIAL U. S. NAVY PHOTOGRAPH

JOURNEY'S END

A Marine safely at journey's end thanks to his parachute. Trained in the intricacies of its use, Marines are able to reach land safely, despite the hazards of war and the elements. His parachute has been brought to its present high state of efficiency by the ingenuity and skill of the American Textile Industry in cooperation with U. S. Navy experts. Not the least important step in the making of Marine parachutes is the processing and finishing of the fabric which helps make the parachute strong, flexible and durable. Onyx textile processing and finishing compounds have helped make, not only parachutes, but hundreds of other textile articles give better service in the many uses of Marine activities throughout the world.

If you have a processing and finishing problem let Onyx Research and technicians work it out with you. They have helped many mills and dyers, they may be able to help you. Your inquiries are solicited.

onyx onyx

ONYX OIL & CHEMICAL COMPANY

JERSEY CITY, N. J.

New England Office: 511 Westminster Street, Providence, R. I. • Charlotte Office: 124 East Third Street, Charlotte, N. C.
Mid-Western Representatives: Maher Color & Chemical Co., Chicago Ill.; Los Angeles, Calif.
In Canada: Onyx Oil & Chemical Co., Ltd., Montreal, P. Q.; Toronto, Ont.

XYNOMINE—PHI-O-SOL—ONYXSAN—ETERNALURE—REPEL-O-TEX

ARALAC*, the new protein fiber made by Aralac, Inc., from milk, opens many new possibilities to textile manufacturers. But the processing of fabrics containing Aralac need present no problems when Colgate-Palmolive-Peet soaps and detergents are used. C.P.P. wetting, fulling, scouring and dispersing agents are effective on all types of materials, regardless of changes due to the war or other reasons.

Ask your local Colgate-Palmolive-Peet representative for detailed information on the full line of C.P.P. processing agents made specially for the textile industry.

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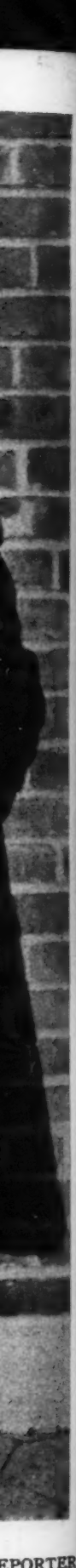
BADGER FLAKES

COLGATE WHITE SOAP FLAKES • ARCTIC CRYSTAL FLAKES

*Trade Mark Reg. U. S. Pat. Off.

DON'T WASTE SOAP
VITAL MATERIALS NEEDED TO WIN
THE WAR ARE USED IN MAKING SOAPS



QUALITY

GDC

This rigorous war has made us return to basic principles, to the frugal habits of our forefathers. * Life has once more become a serious business. Rationing has made us exercise strict economies—develop a vigilant sense of values. We are back to times of plain living, where every item must have a utilitarian purpose, be able to meet strenuous demands. * * Only those who think and work in terms of unrelenting quality can hold a place in this all-exacting order of things.

GENERAL DYESTUFF CORPORATION

EPORTER

Take an Empty Drum Inventory Right NOW!

HERE IS A LIST OF EMERY PRODUCTS SHIPPED IN DRUMS

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- Fatty acid derivatives
- Saponification crude glycerine
- Twitchell Products, including:
  - Textile processing and finishing oils
  - Bases for metal working oils
  - Emulsifying agents
  - Wetting agents
- Sanitone

New drums can't be had; the metal serves a more useful purpose elsewhere. Existing drums must work *full time.* You can promote better service from your suppliers by seeing to it that all drums are returned immediately after emptying. Why not make this the definite responsibility of one department in your organization?

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New York, N. Y.

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FOR G. I. Full-Fashioneds—

LAUREL EMULSIONS, OILS AND FINISHES FOR RAYON AND COTTON

It's a new era for cotton and rayon full-fashioneds ... they're in the Army now. It's a new era, too, with new problems for finishers, but Laurel Oils and Finishes can simplify their full-fashioned processing. Available for immediate delivery.

Laurel Emulsions give more even cotton yarns, clearer stitch and proper regain.

Laurel Rayon Oils and Finishes help control rayon twist and stretch, prolong the life of the fibers.

Laurel Hosiery Finishes produce the smooth finish that is the pride of the American woman whether on parade or promenade.

Send for trial order and formula today.

SPEED VICTORY—BUY WAR BONDS

SOAPS • OILS • FINISHES

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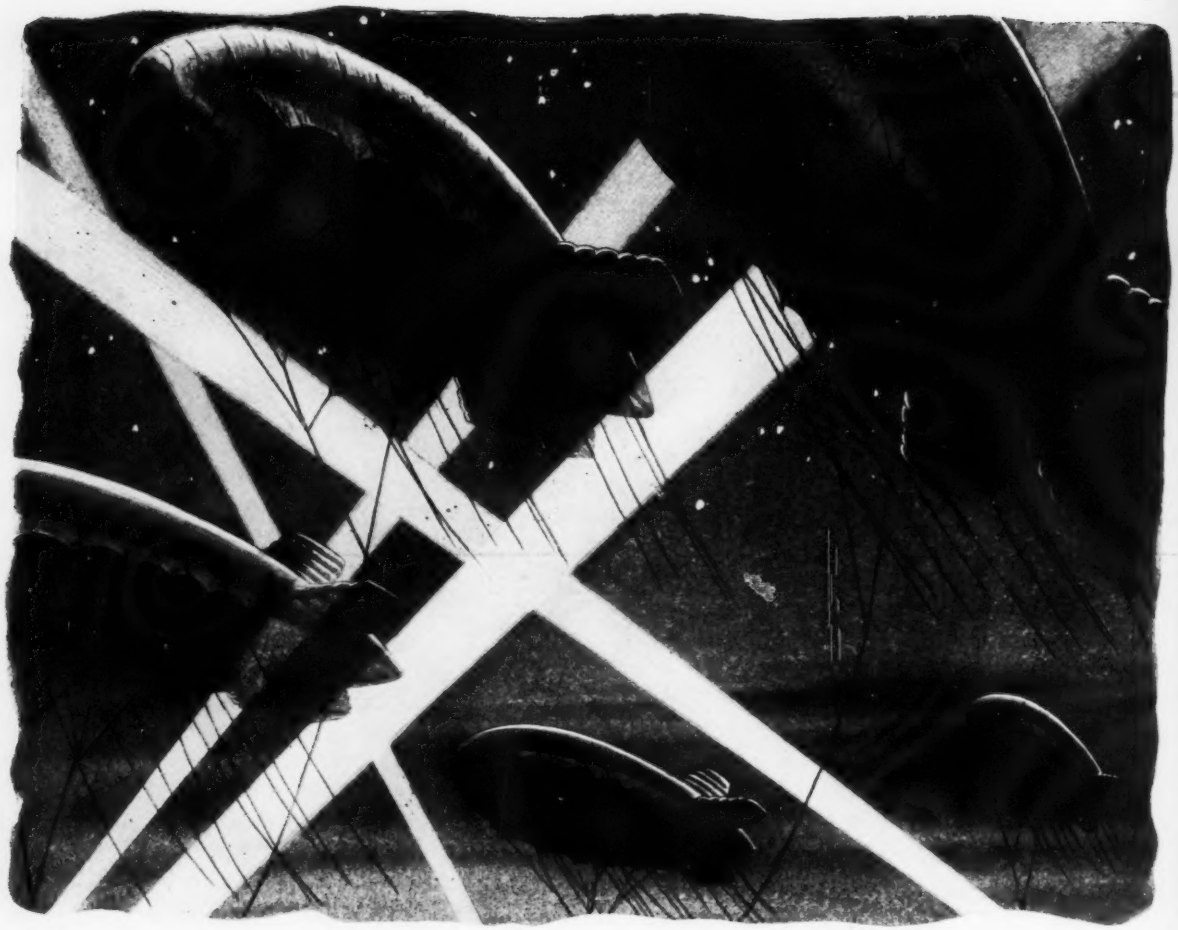

ON GUARD!

Not things of beauty, those huge ungainly barrage balloons that hover over our convoys at sea and over cities and bases overseas! But our boys know well how comforting it is to see in the sky these tough, durable synthetic rubber balloons, with their miles of steel cables, standing guard against attack by enemy bombers.

All over the world, wherever our fighting men go, Mathieson Chemicals in one form or another go with them —not only in barrage balloons, but in ships, planes, tanks, guns, gasoline and lubricants, clothing, food, medical and sanitation supplies. For Mathieson chemicals—chlorine, caustic soda, soda ash, ammonia and other Mathieson products—are vital raw materials in nearly every phase of American war production.

Today, while it goes without saying that "the needs of our Armed Forces come first," Mathieson is exerting every effort to supply materials for civilian needs as well. Tomorrow, when final victory has been won, Mathieson will again stand ready to render its normal peace-time service to American industry.

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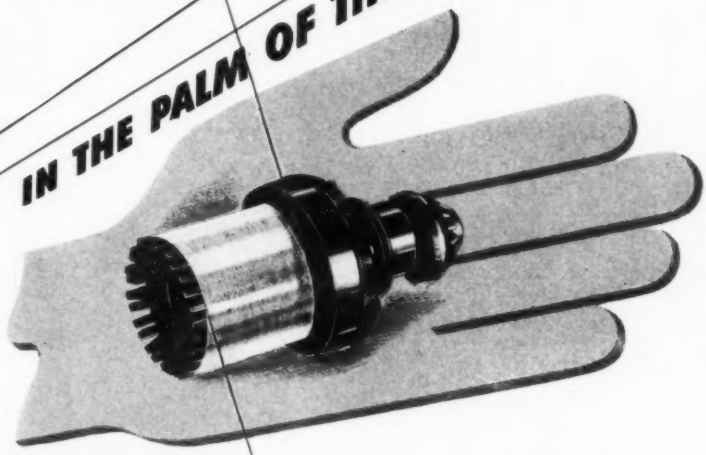
IN THE PALM OF THEIR HANDS



LIES THE *SWORD* AND THE *PLOUGHSHARE*

Just as the textile experts of Industrial produced a new and superior rayon yarn with the development of the famous "Continuous Process" . . .

Just as they quickly converted the "Continuous Process" to the needs of war . . . . . so they stand ready for immediate reconversion back to the works of peace, once the war is won.

And when that day comes, theirs is the skill and experience to blaze new trails, create new standards of rayon excellence. Industrial is proud of these technicians, and of their many contributions to the long history of textile progress.

Industrial
RAYON CORPORATION
MAKERS OF
CONTINUOUS PROCESS RAYON YARN
AND Spun-lo KNIT UNDERWEAR CLOTH

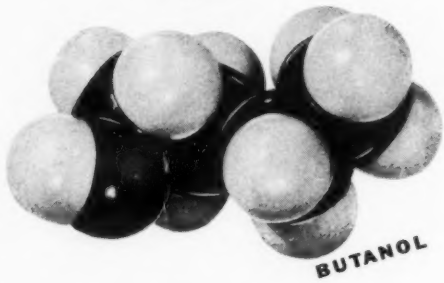
*Reg. U. S. Pat. Off.

CLEVELAND, OHIO · *New York Office, 500 Fifth Avenue*

METHANOL

ETHANOL

Big Brothers in a Family of Twelve



BUTANOL

ISOPROPANOL

THIS molecular family portrait shows the four commercial leaders of the important family of 12 alcohols produced by Carbide and Carbon Chemicals Corporation. The family is so important that most of its members are now restricted to essential war uses.

From the most volatile, one-carbon Methanol boiling at 64.5°C. to seventeen-carbon Heptadecanol boiling at 309°C., these alcohols cover a wide range of physical properties. Anti-freezes, synthetic rubber, lacquers, pharmaceuticals, plastics, and smokeless powder are among the many essential products for which alcohols are required.

The development of so large a family of alcohols is a typical result of the research work of this company. Building with atoms and molecules available in natural raw materials, our chemists and engineers pioneered and are continually enlarging the useful field of aliphatic chemistry. They have synthesized many new chemicals and have produced many others commercially for the first time.

Today, we are producing more than 160 synthetic organic chemicals commercially—about 40 in tank-car quantities. After the war, these versatile materials should be available in greater quantities than ever before . . . and many new compounds with them.

For further information on these chemicals and their uses, write us.

These are the alcohols we make:

Methanol	Hexanol
Ethanol	Heptanol
Isopropanol	Ethylhexanol
Butanol	Undecanol
Methyl Amyl Alcohol	Tetradecanol
Ethylbutanol	Heptadecanol

BUY UNITED STATES WAR BONDS AND STAMPS

CARBIDE AND CARBON CHEMICALS CORPORATION

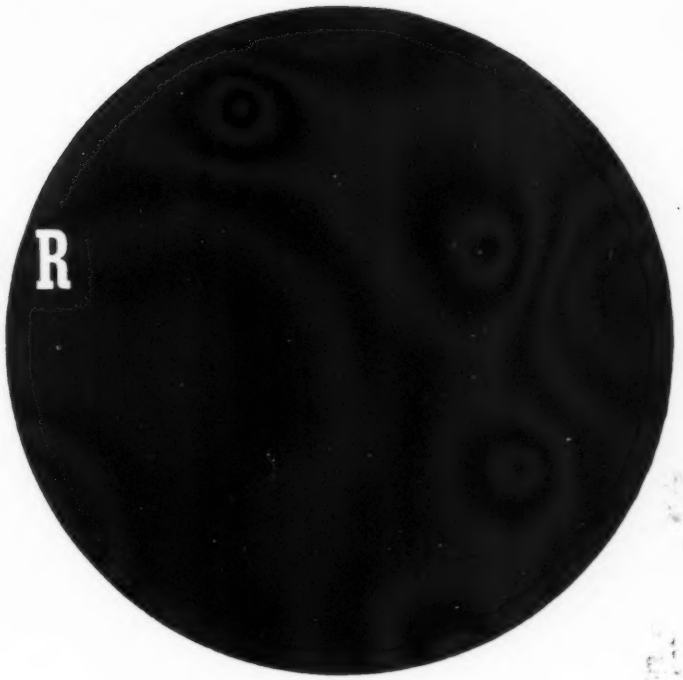
Unit of Union Carbide and Carbon Corporation

UCC

30 East 42nd Street, New York 17, N. Y.

PRODUCERS OF SYNTHETIC ORGANIC CHEMICALS

Eastone* Rubine R



Eastone Rubine R,* a distinctive development among rubine dyes, is a straight dyestuff. It can be dyed with equal success at temperatures used for both jig and box work. Low color percentages for pink dyeings have levelness and uniformity of shade. The deep rubine shades have good fastness to crocking. The general commercial fastness properties of Rubine R are satisfactory for its many recommended uses.

Through painstaking research and formulation, Eastman laboratories have produced an extensive line of dyestuffs for use with cellulose acetate rayon. For information on Eastman Acetate Dyestuffs and their application to synthetic fibers, consult our New York Sales Representative, 10 East 40th Street, New York, N. Y., or write TENNESSEE EASTMAN CORPORATION (Subsidiary of Eastman Kodak Company), KINGSPORT, TENNESSEE.

EASTMAN ACETATE DYESTUFFS

**"Eastone" is a registered trade mark and denotes a type of dye which is dischargeable, as well as usable for plain dyeing.*

FOR SCOURING AND DYEING RAYONS

Yarmor* 302-W Pine Oil

ACTS GENTLY.... GETS RESULTS

Wetting agent and detergent Yarmor 302-W, when made soluble, speeds up the wet-processing of rayons from boil-off to dyeing ... at the same time, gives delicate fibers the gentle treatment they require. Here's why:

YARMOR IS NEUTRAL

... lowers surface and interfacial tensions, puts water and reagents to work without affecting the rayon fiber itself.

YARMOR IS QUICK-ACTING

... cuts down processing time. You'll find this specially refined Hercules pine oil a valuable assistant in the wet-processing of *any* fiber—cotton, wool, silk, rayon and other synthetics. Write to Hercules for technical data, and specify Yarmor 302-W in your scouring and dyeing assistants.

HOW YARMOR 302-W ACTS IN WET-PROCESSING OF RAYON

1. IN SCOURING ...
Yarmor wets fibers down to base, emulsifies gelatinous matter, oils and dirt, suspends for clean rinsing.

2. IN DYEING ...
Yarmor disperses dye, helps lay down even depth of color, retards formation of insoluble soap precipitates.

NAVAL STORES DEPARTMENT

HERCULES POWDER COMPANY
INCORPORATED

993 Market Street, Wilmington 99, Delaware

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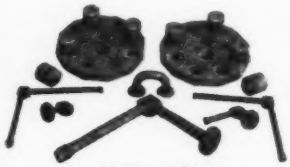
*Reg. U. S. Pat. Office

Porous Carbon Diffuser



Pipe, Fittings, Bubble Caps and Trays

Headers for heat exchanger

Sections of segmental type reaction tower

Tube and shell heat exchange unit

For Continuous and Reliable Service

NATIONAL AND KARBATE CARBON AND GRAPHITE PRODUCTS
TRADE-MARK TRADE-MARK

are extremely versatile and readily adapted to the construction of equipment of conventional design as well as special equipment of new design.

Outstanding performance and economies, along with simplification of design, are made possible by the following unique and advantageous combination of physical and chemical properties offered by these materials.

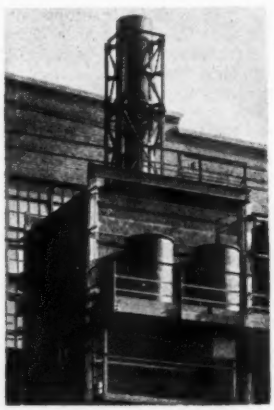
Resistance to severe thermal shock ⁄ No deformation at high temperatures ⁄ Not wet by molten metals – no sticking ⁄ Mechanical strength maintained at high temperatures ⁄ No reaction with most acids, alkalies and solvents — no contamination ⁄ High rate of heat transfer (Graphite and graphite base "Karbate" products) ⁄ Low rate of heat transfer (Carbon and carbon base "Karbate" products) ⁄ Low thermal expansion ⁄ Good electrical conductivity ⁄ Self-lubricating ⁄ Available in impervious grades ⁄ Available in highly permeable (porous carbon and graphite) grades ⁄ Easily machined and fabricated.

Practically any design can be machined or fabricated from available stock in the form of beams, blocks, slabs, brick, plates, round and rectangular rods, tubes and cylinders, pipe, fittings, valves, tower sections and tower accessories.

Special shapes or forms can be molded or extruded when quantity justifies.

The illustrations show only a few of the many diversified applications of these products.

Write for descriptive literature



47' high all-carbon electrostatic precipitator

Return bend cooling coil

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Unit of Union Carbide and Carbon Corporation
UCC
CARBON PRODUCTS DIVISION, CLEVELAND, OHIO
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Branch Sales Offices: New York - Pittsburgh - Chicago - St. Louis - San Francisco

Pioneering
WITH Pigments
—one of a series of developments illustrating the advantages of Aridye* pigmented colors in new and significant applications

HOW A JUNGLE HAMMOCK, A MOSQUITO BAR AND A HEADNET POINT THE WAY TO *Improved Color Fastness* ON KNITTED COTTON FABRICS AND MARQUISETTES

About a year before Pearl Harbor, this problem was put up to Aridye: "Can we dye mosquito netting for jungle hammocks, mosquito bars and headnets with fast-to-light olive drab color, control shrinkage, give a permanent finish and weather resistance all in one continuous operation?" A challenging problem involving not only lightfast colors and proper selection of binder, but also new application and curing techniques!

Here's how the problem was solved by the Development Laboratories of Aridye Corporation—

Since extreme light fastness was essential, pigments were chosen that could stand 300 hours in the fadeometer. Because of the need for shrinkage control, the binder selected was Ceglin†, a cellulose finish. Careful dispersion of the pigments in this medium and proper application on a good padder assured even, uniform dyeing of the fabric. Curing was then effected by a continuous process of coagulating the Ceglin in a souring bath, neutralization and drying of the fabric. Over 50 million yards have now been dyed and finished with this continuous method!

The resultant light fastness, improved finish and shrinkage controls are now available for the pigment-dyeing and finishing of many kinds of civilian fabrics. This new development means that curtains and knit goods can be dyed faster to light than heretofore, shrinkage can be controlled and the goods finished *all in one operation!*

Successful and satisfactory results depend, of course, upon three factors: (1) technically correct pigmented colors (2) must be properly applied and (3) adequately cured.

An illustrated, more detailed folder has been prepared on the subject of pigment-dyeing of knitted cotton fabrics and marquisettes, and will be sent without obligation to all finishing plants requesting it. Send for your copy today!

Aridye Corporation has been appointed as a sales agent for Ceglin, a product of Sylvania Industrial Corporation.

*Reg. U. S. Pat. Off.
†Reg. U. S. Pat. Off. Sylvania Industrial Corp.

Aridye TEXTILE COLORING MATERIALS

ARIDYE CORPORATION • A SUBSIDIARY OF INTERCHEMICAL CORPORATION
FAIR LAWN, NEW JERSEY • PROVIDENCE, RHODE ISLAND • ROCK HILL, SOUTH CAROLINA

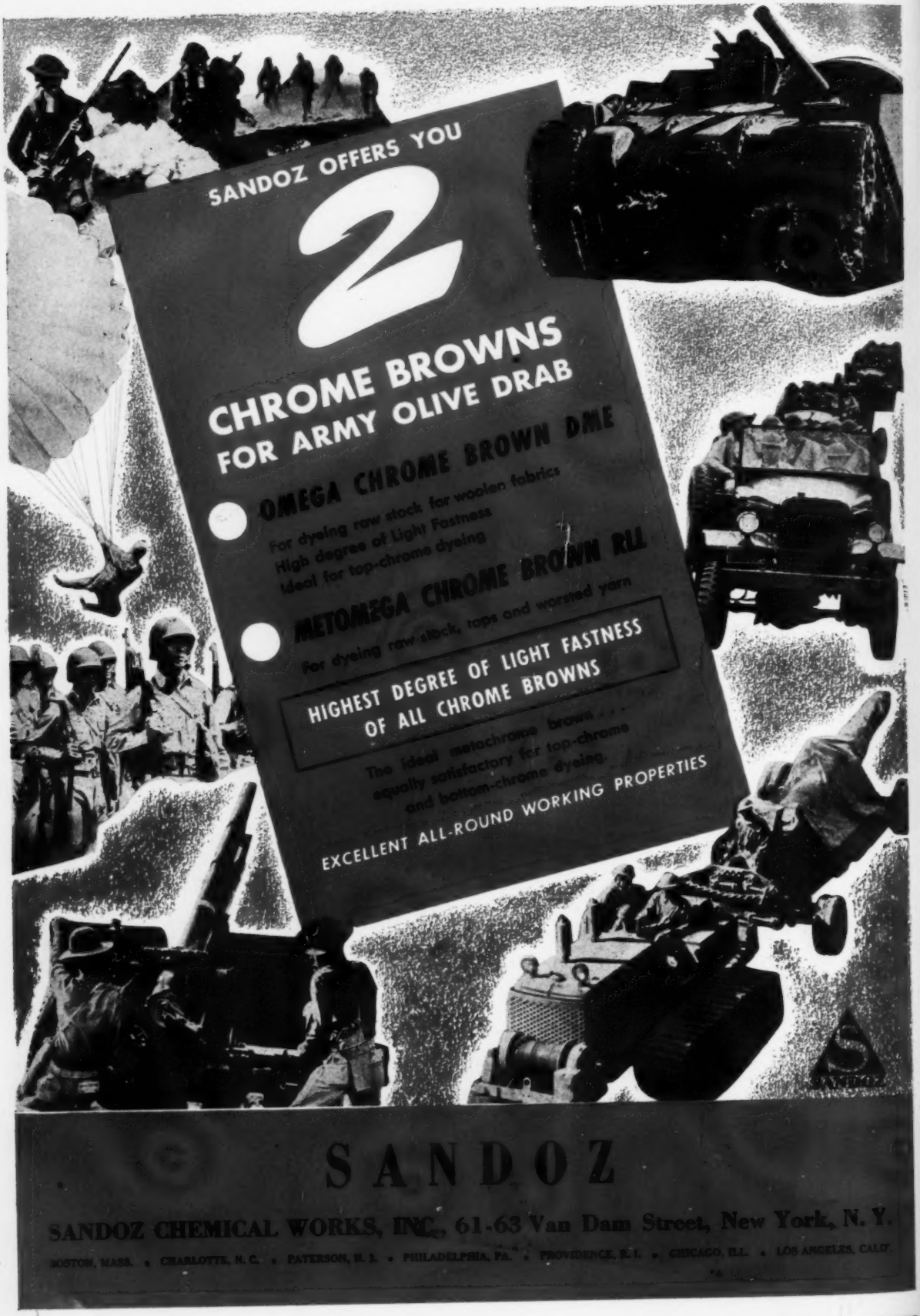
THIS IS NO TIME TO SHINE

No, maybe some of the stockings you've seen lately won't quite shine in a blackout, but they're certainly just like mirrors at any other time. The soft, sheer, eye-caressing, dullness that has long characterized quality hose is nowhere to be found in these products of a hectic period. • Amazing as it may sound, these stockings when treated with Fancourt's Dulzit become a definite asset to any woman's charm equipment. Just another example of Fancourt laboratory research in action. A talk with one of our field men will put our complete facilities at your disposal.

W. F. FANCOURT & CO.

PHILADELPHIA, PA.

Solving Finishing Problems Since 1904
In the South, Howard A. Virkler, Greensboro, N. C.


SANDOZ OFFERS YOU
2
CHROME BROWNS
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For dyeing raw stock for woolen fabrics
High degree of Light Fastness
Ideal for top-chrome dyeing
METOMEGA CHROME BROWN RLL
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The ideal metachrome brown . . .
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FINISH *for* TEXTILES

SYLVANIA

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Ceglin, functioning unusually well with water-repellents and mildew-proofing agents is economically applied either in the usual manner, or before kier boiling.

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Works and Principal Office: Fredericksburg, Virginia

*TRADEMARK REG. U.S. PAT. OFF.

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on FANCY FABRICS
with
INDIGOSOLS

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SEPTEMBER 13, 1943

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WHEN you get a strange new mixture of fibers to dye or print

WHEN an unusually difficult color match is urgently needed

WHEN dyehouse costs get out of line

WHEN color formulas must be changed to handle non-priority orders

THEN *National Aniline Can Help*

You know the National Technical Service man, of course. His first job is to be helpful to you... to bring you the composite experience of National Technical Service in every field where color is used...to help you match your standards of fastness with the dyes immediately available.

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DYESTUFF REPORTER

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Soil Suspension Method for Testing MILDEW RESISTANCE of Treated Fabrics

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THE soil-suspension test described here was developed in connection with studies on the effectiveness of mildew-resistant treatments on household fabrics used out-of-doors, such as awnings and porch furnishings. When the need arose in the present war emergency for a quick, reliable method for testing the mildew resistance of treated sandbags, tarpaulins, and other military fabrics, this method was also applied to these types of materials.

In continuation of related studies (2, 3, 4, 8, 10, 11, 12)[1] the soil-suspension test was devised through research in which the objective was an improved method of testing that is both rapid and dependable. It has been used on various types of fabrics and kinds of fibers and it is considered sufficiently drastic to test military and other outdoor fabrics subjected to deterioration by microorganisms. Samples to be tested are inoculated by immersion in a soil suspension. Thus they are subjectd to a mixture of many types of microorganisms which attack cellulose. Samples are then incubated under controlled temperature and humidity conditions. Tests are completed in a relatively short time. The procedure is simple and requires neither expensive equipment nor the services of a bacteriologist.

TEST METHOD

Preparation of Samples for Test

Wash approximately one linear yard of each treated fabric to be tested and one-half yard of the same fabric untreated under running water for 24 hours. The washing container should provide about 1 gallon of water for each ounce of fabric. The rate of flow should be gentle, but provide at least 3 complete changes during 24 hours. Direct fall of water on the fabric should be prevented.

Cut 20 strips from each treated fabric and 10 from the untreated in the direction of the warp and as widely separated through the materials as possible. Make the strips 6 inches long and 1¼ inches wide if there are 50 or more yarns per inch; 6 inches long and 1½ inches wide if there are less than 50 yarns per inch. Ravel the strips to 1 inch width by taking approximately the same number of yarns from both sides of the strip (2). Ten strips of the treated fabric are used for the test samples and ten for the breaking strength of the original treated fabric. The ten samples of untreated fabric are inoculated at the same time as the test samples and serves as a check on the microbial activity of the soil.

If the fabric to be tested is so loosely constructed that it ravels easily, cut twice as many test samples and controls. Also cut the strips 6 inches long and 2½ instead of 1½ inches wide and ravel them to 2 instead of 1 inch.

Soil for Soil-Suspension Test

Use soil rich in the forms of microbial life that decompose cellulose. Compost it according to usual greenhouse practice from one-third sandy loam field soil, one-third well-rotted manure, and one-third muck soil. Layer these three materials in a compost pile for about 6 months, then slice the soil from the pile, shred and pulverize it well. Suitable composted soils may be obtained from local greenhouses or gardens. Arrangements may be made with the Bureau of Human Nutrition and Home Economics to obtain composted soil for this test.

Culture Medium

Prepare a suitable liquid culture medium. The following composition (8) was found successful in this laboratory. Distilled rather than tap water was used since the tap water that was available has an unusually high concentration of copper salts.

Ammonium nitrate	1.0 gm.
Di-potassium acid phosphate	1.4 gm.
Magnesium sulfate	0.7 gm.
Calcium carbonate	0.005 gm.
Sodium chloride	0.005 gm.
Distilled water	1000 ml.

[1]Numbers in parentheses refer to literature cited.

Test Procedure

For the culture bottle, use a 16-ounce square bottle with a glass fabric filter in the cap. Place a strip of glass fabric[2], approximately ⅛ inch thick and cut 2 inches wide and 6 inches long, in the bottle in a convex position so that only the lengthwise edges touch the bottle and the center of the strip is approximately ½ inch from the bottle. The glass cloth serves as a support for the test fabric and as a wick to draw up the culture medium (8). Add sufficient culture medium to each bottle so that the glass wick will become thoroughly wet and there will be approximately 5 ml. of solution in excess. Care must be taken against using too much liquid medium or the test strip during incubation will become so wet that growth of the microorganisms will be inhibited.

Inoculate the fabric to be tested by immersing five test strips at a time for 30 minutes in a thin suspension of soil, containing 70 gm. of soil to 250 ml. of distilled water. Agitate the strips frequently during this time. Remove them from the soil suspension, place each strip on the glass wick in the culture bottle, and incubate at approximately 28° C. for 10 days for cotton fabrics and 14 days for jute fabrics[3]. In inoculating additional strips prepare a fresh soil suspension.

At the end of the incubation period the test samples (treated fabric) may have amounts of growth upon them varying from none to copious—depending upon the efficiency of the treatment. The inoculated controls (untreated fabric) should be well covered with a more or less even coating of microbial growth. Record the appearance of the samples, wash, and dry them. Determine the breaking strength of the three sets of strips—the test samples of inoculated treated fabrics, the original treated fabric, and the inoculated controls of untreated fabric—according to the raveled-strip method and under the standard conditions of 70° F. (21° C.) and 65 per cent relative humidity (2).

[2]If glass cloth is not available for the cap or the wicks the following substitutions may be made: Use ordinary screw cap, but adjust it loosely to allow free exchange of air. Make up medium as above but add 10 gm. of agar to every liter of medium. Melt the culture medium and distribute it into culture bottles—approximately 75 ml. to each bottle, then place the bottle in a horizontal position and allow the agar to harden. This serves as a support for the inoculated test fabric.

[3]To shorten the incubation time, a pre-incubated wick of soil and cotton batting may be used as a support for the test strip. To make the wick, first place sufficient loose soil in the culture bottle to cover one side of the bottle when in a horizontal position. Then place a layer of cotton batting, ½ inch thick by 2 inches wide by 5 inches long, over the soil and cover the cotton sparsely with another layer of loose soil. Moisten the wick with approximately 50 ml. of a culture medium containing 2.0 gm. of ammonium nitrate, 2.8 gm. of di-potassium acid phosphate, 11.8 gm. of magnesium sulfate, and 0.5 gm. of peptone in 1,000 ml. of distilled water. Incubate the wick in the culture bottle at approximately 28° C. for 5 days. At the end of the period, use this wick as the support for the inoculated test strip which is inoculated as above and incubated at approximately 28° C. for 8 days for cotton fabrics and 12 days for jute fabrics.

In this modification the incubation period for cotton test strips is shortened from 10 to 8 days. However, in preparing and handling the culture bottles more work is involved than in the glass wick method. Also, since the wicks must be incubated for 5 days and the test strips for 8 days more, the total incubation period for this method is somewhat longer than is suggested for the glass wick and the agar slant methods.

An indication of the microbial activity during the test procedure is secured from the breaking strength of the inoculated controls (untreated fabric). They should lose practically all their strength within the incubation period. For example, in tests made in this laboratory using glass wicks and agar slants[2] untreated 7-ounce osnaburg controls lost approximately 60 per cent of their strength after 5 days of incubation, and approximately 90 per cent after 7 days; 8-ounce cotton duck controls lost approximately 40 per cent of their strength after 5 days of incubation, 70 per cent after 7 days, and approximately 90 per cent after 12 days. When pre-incubated wicks of soil and cotton batting[3] were used, untreated 7-ounce osnaburg controls lost approximately 70 per cent of their strength after 5 days incubation, 90 per cent after 6 days and 100 per cent after 7 days.

Evaluation of Results

The effectiveness of the treatment under test is determined from the breaking strength of the inoculated test strips in comparison with that of the original treated fabric.

Results can also be evaluated in terms of a standard. To do this a set of controls containing a known amount of a selected compound, such as copper naphthenate, is inoculated and incubated along with the treated samples under test. Then a comparison is made between the breaking strengths of the inoculated test samples and this inoculated standard control. Cotton osnaburg treated with copper naphthenate so as to contain one percent copper by weight of the fabric may be used for the standard.

MICROORGANISMS ISOLATED FROM SOIL

In order to determine what microorganisms in the soil used for this soil-suspension test caused rotting of the fabrics, cultures were made from the growth on inoculated strips of 8-ounce cotton duck at time intervals of 2, 5, 7, 9, 12, and 14 days after inoculation. These cultures were plated in soil extract agar, cellulose agar, and in Sabouraud's medium (9).

Representative organisms from each of the plates were replated on filter paper and mineral salts agar (2) and the organisms that showed good growth were isolated in pure culture and identified (1,7). It was observed that as the incubation period increased from 2 to 14 days the relative number of bacterial colonies decreased in proportion to fungi growing on the strips. This became more and more evident from the seventh day on. After 12 days there was little bacterial growth. Fungi were present on the second day and increased in relative importance after the seventh day. *Mucors* which have little, if any, action on cellulose were present on all the plates made from the growth on the strips. Various kinds of *Aspergilli* and *Penicillia* were numerous at all times. *Actinomyces* were also isolated. The microorganisms noted on the fourteenth day after inoculation seemed to be the same as those previously isolated.

The effect on cotton duck of each of these microor-

ganisms was then determined by measuring the change in breaking strength of strips of the fabric after inoculation and incubation for 14 days with the different isolated microorganisms.

Chaetomium globosum, the *Metarrhizium* sp., and one of the two species of *Fusarium* that were isolated completely deteriorated the fabric. They colored it yellow gray, yellow green, and yellow black, respectively. The following microorganisms caused between 60 and 75 percent loss in strength; *Acrostalagmus albus*, certain species of *Alternaria, Cladosporium, Fusarium, Helminthosporium, Papulospora*, and one species of *Penicillium*. Most of these microorganisms made the fabric gray.

Aspergillus flavus and A. tamarii, the *Trichoderma* sp., and the two species of *Actinomyces* caused about 30 percent loss in strength. Of these microorganisms the first two made the fabric brown and gray, respectively, and the others did not color it. One of three unnamed species of *Aspergillus* caused about 20 percent breakdown and gray spots. The other two species of *Aspergillus*, also the two species of *Mucor* and three of the four *Penicillia* that were isolated did not deteriorate or stain the fabric.

In addition to the above microorganisms various members of the group of organisms that do not fruit readily were isolated. These could not be identified but they completely deteriorated the fabric and colored it yellow green.

APPLICATION OF SOIL-SUSPENSION TEST

Various chemical treatments that, in previous studies (5, 6), have been found to make cotton resistant to *Chaetomium globosum* were applied to 7-ounce cotton osnaburg and the treated fabrics subjected to the soil-suspension test. Samples were leached in running water for 24 hours and inoculated with the microorganisms in soil[4] using glass wicks and glass fabric filters in the bottle caps. To make the test more severe, the strips were incubated for 14 rather than 10 days. Figure 1 shows the protection given by two of the treatments as compared with the lack of protection on an untreated strip.

The details of the treatments that were used and their effectiveness against rotting are given in Table 1. Some of the treatments required immersing the fabric in more than one chemical solution. Each strip was processed separately in 50 ml. of the finishing bath for the stated temperature and time. The strip was quickly removed and pressed between two sheets of blotting paper. The sample was dried at room temperature for 48 hours, after which it was rinsed twice for 5 minutes in two changes of water at 25° C., pressed as before, and dried at room temperature.

Each value in Table 1 showing the effectiveness against rotting of the various finishing treatments applied to cotton

[4]The soil available for these tests was the kind recommended. It had been used for the experimental growing of tomato plants for which various commercial fertilizers had been added.

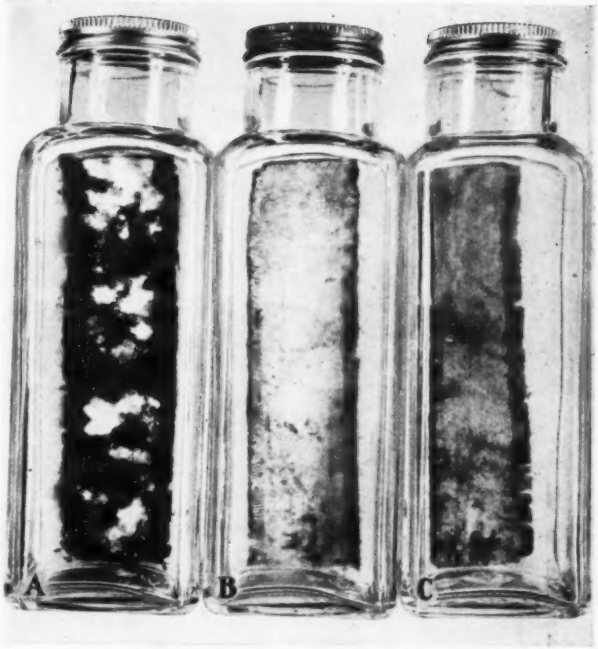

Figure 1. Fabric strips inoculated with soil suspension and incubated for 14 days: A, untreated; B, treated with cuprammonium hydroxide, and C, treated with copper naphthenate.

osnaburg is calculated from the average of 10 breaking strength determinations and is reported as the percentage change in breaking strength of the treated fabric after inoculation and incubation with garden soil. A percentage change in breaking strength amounting to 10 percent or more is statistically significant.[5]

Five of the nine finishing treatments as applied were found to be effective when tested by the soil-suspension method (Table 1). They are: Copper naphthenate; cuprammonium hydroxide; lead acetate with potassium dichromate; and the natural dye extracts—cutch and osage orange, with copper sulfate and potassium dichromate.

An additional treatment—copper sulfate with soap—gives considerable protection since samples treated with this finish lost only 25 percent of their strength. No doubt, under many conditions of use, the treatment would be entirely satisfactory. In interpreting results of this soil-suspension test it should be remembered that the test is very severe and greatly accelerates the deterioration encountered in the normal use of fabrics. The other three finishes, under the conditions of application used here, have practically no protective action according to this test.

Some 7-ounce osnaburg samples[6] which had been commercially treated with varying amounts of two mildew-resistant finishes were also tested by the soil-suspension method. Six different concentrations of copper naphthe-

[5]The "t" test with the 5 per cent level of significance was used to judge the differences in average breaking strength.

[6]Acknowledgment is made to Arnold, Hoffman & Company, Providence,, R. I., for supplying these treated fabrics and analyzing them for copper content.

TABLE 1

The Resistance of Treated Cotton Fabric to Microorganisms in soil

Finishing Treatment	Chemical	Bath 1: Concentration	Bath 1: Temperature at Which Fabric Was Immersed	Bath 1: Time	Chemical	Bath 2: Concentration	Bath 2: Temperature at Which Fabric Was Immersed	Bath 2: Time	Change in Breaking Strength After Inoculation and Incubation with Soil
		Grams Per 100 ml. Water	*°C*	*Minutes*		*Grams Per 100 ml. Water*	*°C*	*Minutes*	*Per Cent*
Cadmium chloride with morpholine	Cadmium chloride	5.0	100	15	Morpholine	[2]	25–30	15	—81
Cadmium chloride with soap	Soap	1.0	100	10	Cadmium chloride	1.0	100	30	—78
Copper sulphate with morpholine	Copper sulphate	5.0	100	15	Morpholine	[2]	25–30	15	—54
Copper sulphate with soap	Soap	1.0	100	10	Copper sulfate	10.0	100	30	—25
Copper naphthenate	Copper naphthenate emulsion[3]	20.0[3]	25–30	30	.....	...	...	..	+ 5
Cuprammonium hydroxide	Cuprammonium hydroxide[4]	10.0	25–30	30	.....	...	...	..	— 2
Lead acetate with potassium dichromate[5]	Lead acetate	1.0	25–30	10	Potassium dichromate	0.3	25–30	10	—11
Natural dyes									
Cutch	Cutch (liquid extract)[6]	0.6	100	16-18 hrs.	Potassium dichromate	0.3	100	30	— 3
	Copper sulphate	0.3							
Osage orange	Osage orange (liquid extract)[7]	0.6	100	16-18 hrs.	Potassium dichromate	0.3	100	30	—10
	Copper sulphate	0.3							

[1] The plus sign preceding the value indicates an increase in breaking strength; a minus indicates a decrease. All values of 10 per cent and greater represent a significant change in strength from the original treated fabric.

[2] Fabric strips immersed in 50 ml. of morpholine.

[3] Commercial product contained approximately 6 per cent copper computed as metal and was dispersed in Stoddard solvent. Treated fabric had 75 per cent wet pick-up, 1.5 per cent dry pick-up.

[4] Cuprammonium hydroxide containing 1.5 per cent copper and 20 per cent ammonia, prepared as directed in U. S. Dept. Agr. Tech. Bul. 406, "A study of the raw cotton and the yarn and sheeting manufactured from three grades of American upland cotton," March, 1934.

[5] Repeat bath 1 and bath 2 of treatment procedure three times.

[6] Cutch (liquid extract) contained 25 per cent tannin.

[7] Osage orange (liquid extract) contained 27 per cent tannin.

Figure 2. Percentage loss in breaking strength of fabrics treated with different concentrations of copper-containing, mildew-resistant finishes and tested by the soil-suspension method.

nate and four concentrations of a mixture of equal parts of copper oleate and resinate had been used. The samples were analyzed for copper content, water leached, inoculated with soil suspension and incubated on glass wicks for 14 days.

According to the results (figure 2) 0.5 percent or more copper in the form of copper oleate and resinate mixture was needed to give good mildew protection, that is, if the fabric was to retain at least 90 percent of its strength (11). This is considerably less than the 0.65 percent required for the copper naphthenate-treated fabric. However, as the copper content of the fabrics decreased, copper naphthenate gave better protection against rotting than the copper oleate and resinate mixture. Perhaps this is one reason copper naphthenate has been considered more satisfactory for certain outdoor fabrics that are leached by rain and other weather conditions.

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TEXTILE RESEARCH AND DEVELOPMENT*

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THE "Mather" lecture was delivered on the occasion of the Annual Meeting of the Textile Institute, held at the Engineers' Club, Manchester, on Wednesday, May 5th, 1943.

In introducing the lecturer, the President, Mr. H. L. Johnson, F. T. I., said: Ladies and Gentlemen, I call upon our old friend, Sir Robert Pickard, to address you. He requires no introduction, because he is so well-known already to any student of textile technology. He has literally devoted his life to the study of the subject upon which he is to speak, and he occupies a place in the forefront of textile research. We are very fortunate indeed in being able to secure such a speaker to present us with our annual "Mather" lecture.

Sir Robert Pickard: Mr. President. I feel it a great honor to be one of the long list of distinguished "Mather" lecturers. I have not been on the Council of the Institute since the last months of the last war, but in the intermediate time, for many years, I have taken a part in ensuring that the publications of the Institute reach a high standard, and a standard which will bring the Textile Institute into the category of a Learned Society with a journal of high repute for originality. The work of the Textile Institute covers all fibers and all fabrics.

The science of textiles is a very wide one, and cannot be accurately defined. It embraces portions of almost every form of study to which the name of a science has been given, and its practice includes research and investigation. I will dwell for a few moments on the distinction between research and investigation. Research corresponds more or less to the Transactions portion of the *Journal*, and investigation to the Proceedings part.

The word "Research" very unfortunately in my opinion, is used largely for advertisement purposes in British and particularly American industry. I am not deprecating the advantage that comes to a firm from the possession of a good research department, but I think there is a great deal of misnamed "research" among pages of advertisements.

Research in the Textile Industry may be of two kinds. It may be research after novelty in the production of a fabric and novelty in the improvement of a process. I am not excluding chemical research, or research of a chemical engineering character, some of which leads to the production of a man-made fiber. Research shades off into "development," a term which is very freely used at the present time and might be described as the attempt to apply a novelty discovered in the laboratory to production. But then again, some so-called development shades off into investigations which are sometimes mis-named research and merely aim at "trouble shooting" or trouble avoiding.

I may illustrate my point on this aspect by reminding you of a nomenclature which has been used at the Shirley Institute for many years. We are very pleased to investigate for members what we call a defect; but if a member brings in a defective material a second time, we then call that a fault, provided, of course, that we have been able on the first occasion to tell him how to avoid the defect. We draw a distinction between defects and faults, and we do not undertake to investigate faults.

Before I delve deeper into my subject, I want to point out that scientific research, development and investigation are not the whole story of the possible improvement of the textile industry. There is the very important aspect of design, but I am leaving that on one side during this afternoon's talk.

Research, at bedrock, is based on education. Obviously it is based upon the education of the research workers, but the application of the research—the reception of the ideas and their utilization—depends upon the education of the people to whom the results may be of possible use. When I survey the education which is available to the individual who is going to spend a good portion of his life in the textile industries, I find that, at any rate up to recent years, the position has not been very satisfactory. It is true that there are "Textile Industries" departments in the University of Manchester—at the College of Technology, and also at the University of Leeds and at the Bradford Technical College. There are textile departments in the great majority of the technical colleges and institutions of Lancashire and Yorkshire; but the vast majority of these are tied to one fiber and teach the textile technology—as distinct from the science—of one fiber mainly. I would put in a plea, though perhaps some progressive institutions have already ameliorated the position, for some more generalized textile education to be given to prospective employees in the textile industries.

*The Mather lecture, reprinted from the Journal of the Textile Institute (England).

We have many teachers of cotton technology, and we have many teachers of woolen technology; but it is perhaps anomalous, that so far as I know, there is no special teacher of the technology of rayon processing. It may be because rayon has been utilized on cotton or woolen machinery with very slight adaptations.

In my general plea for the academic world to take more cognizance of general textile technology, I hope that in regard to special adaptations of ordinary, conventional machinery of the old-fashioned industries it will not be forgotten to bring into the curriculum work in connection with the utilization of rayon. I think it is not out of place for me to point out that one of the professors in a textile industries department, Professor Morton, of Manchester, and formerly on the staff of the Shirley Institute, has already published a book on the general principles of spinning, treating the subject more or less independently of particular fibers.

Now, what of the future? I am of the opinion that the trend of textile products is towards mixtures of fibers. If textile science, which I will speak about in a moment or two, has accomplished anything, it has tended to suggest that for a specified purpose there is an ideal fiber or an ideal mixture of fibers. This trend towards a mixture of fibers in a fabric for a given purpose is tending to obliterate the traditional geographical distribution of the textile industries. It is obvious that the traditional distinction between Lancashire, on the one hand and Yorkshire on the other is becoming rapidly obliterated.

A given mill will always be open to use more than one fiber. An example which will appeal to a great many towns, is the position of the traditional silk firms who have gone from silk to rayon. Owing to the exigencies of the war some of them are in fact going over to nylon. I do not think it is far-fetched to think that when the war is over they may deal with at least three fibers.

Textile science is a development of the period between the two wars. I am not forgetful of the fact that there were pioneers in research of the very highest type on some of the fibers and their utilization before the first World War, but the systematic development of science as applied to textiles, to all intents and purpose, is a development between the two wars.

What have the textile scientists been doing? As far as the well-known laboratories are concerned—those laboratories which are not incorporated in the organization of a single firm—they have been largely devoting their efforts to a meticulous examination of the properties of the different fibers, to setting out with exactitude the characteristics of those fibers, and their behavior under different conditions. This has led, in the main, to facilitating the choice of fibers for a cloth to fulfill certain requirements, on the one hand, and, on the other, to the control and elaboration of what may be called, generally, chemical finishes.

Let me illustrate by taking three examples of the ways in which scientists have been applying their efforts to the improvement of textiles. They seem to me to be outstanding.

The first example is a very simple one in its inception, but it was late in coming. It is the self-sealing cloth which has been developed during the war by my colleague, Dr. F. T. Pierce. He realized that the cotton fiber, if it were in a fabric in a condition in which it could swell with moisture, would, in contact with water, block up the interstices of the cloth and make it water-holding and water-resisting without any proofing whatsoever. Dr. Pierce seems to have succeeded in making a hose-pipe on that principle, by taking a long, strong cotton, spinning it with a very low twist, weaving it closely, and relying on the physical characteristics of the cotton to swell with moisture. His hose-pipe will in fact stand up to Home Office tests, which are very stringent in the way of water-penetration pressure. He has followed on with water-holding canvasses, and has recently made garment cloths which are, in a sense, waterproofs, though with scarcely any proofing at all.

It is a very simple idea. From a study of the physical characteristics and an interpretation of the facts in regard to a very old material, Dr. Pierce has succeeded where other people have not, so far as I am aware.

Another type of research I might mention in regard to water repellency work is the so-called Velanizing process of Imperial Chemical Industries Ltd. That is the production of the organic chemist who, working with very complicated substances, has found some that combine with the fabric and make it water repellent, though leaving it still permeable to air. The Velanizing process is a good example of the efforts of the organic chemist in making use of so-called chemical finishes. It is an outstanding example of the results of research.

The third example is the anticrease process brought forward by the Tootal Broadhurst Lee Co. Ltd. It illustrates, on the one hand, the difficulty of the development of research, and, on the other hand, it shows how long it takes to get a result not only in the laboratory but in production. Speaking from memory, when I heard Sir Kenneth Lee describe the process in London some years ago, he said that his firm employed a team of chemists for the specific purpose of removing the disability which certain cellulosic fabrics possessed of creasing. The logic adopted by those chemists was that if cotton had a disability it must be due to one of two things, and there must be one or two remedies; either something must be taken away or else something must be put in. They could only put that something in after long years had elapsed, according to Sir Kenneth Lee's statement, and then ultimately they succeeded in carrying over from the laboratory a very notable result to the mill.

We have thus three examples which, to my mind, are outstanding illustrations of some of the ways in which textile research can aid the textile industries.

During the course of the last war the chemists of the Royal Society had a meeting at which it was resolved to

press upon the Government the necessity for a more intensive application of science to industries. A similar idea had occurred to a great many other people. I think a former "Mather" lecturer stated that the Government Department in London had a first inkling that a section of the cotton industry in East Lancashire were prepared to provide money for industrial and scientific research when they received a communication from a certain Dr. Pickard, of Blackburn, in 1916!

The Shirley Institute has developed from very small beginnings and its phase of development is still only at the beginning. I have not myself formed any opinion as to when that development will come to a finish. The Shirley Institute has a long way to go yet. My Council have bought another eight acres of land, with a view to effecting further development. They agree with me that the possibilities of development for a scientific institution like the Shirley Institute, serving the cotton industry, the rayon industry and the silk industry, are by no means exhausted.

A great deal of debate is taking place in other industries, as well as our own, about the position of research as applied to industry in this country; and much of that debate has been stimulated by people who have been to America. They have come back and told us that England is not so research-minded as America. The American temperament seems to be different from that of the English industrialists. The American temperament is to grasp avidly for new things merely because they are new, which is rather the reverse of the state of things in the textile industry in Britain.

Industries differ very much. If we take the electrical industry, say, and contrast it with the cotton industry we find that the cotton industry has been established for many years, and that it was developed empirically by inventors, whereas the electrical industry is based on science, or was developed from science, and has never been without the assistance of science from the very beginning. Consequently, when we survey the industrial research associations which were created at the end of the last War we find a very strange coincidence. We find two of them leading the others in size—not that size is necessarily a criterion of efficiency—but we find that the Electrical and Cotton Research Associations are far larger than the others, although the one for Coal Utilization has recently and suddenly shot out beyond the size of the E. R. A. and B. C. I. R. A. But what is the position in the respective industries? In regard to the electrical industry it has been stated that of all the research work carried out in this country only one-twelfth is carried out by the Central Research Association. Eleven-twelfths of the work is done in the industrial laboratories attached to the big combines and the engineering concerns. In regard to the cotton industry I think it would not be misleading to say that of all the research work carried out in the country eleven-twelfths is done by the Research Association and only one-twelfth in the laboratories of the different firms. My figures may not be exact, but the contrast is something of that order.

The textile industries with very many small units have not accepted readily the reputed advantages of co-operatively financed research. In the Research Associations the subscriptions have been based in varying ways on the relative size of the concerns. These variations depend on agreed equivalents in the vertical sections of the industry, so many spindles to a loom, to a printing machine, etc. Thus the large combine has paid a relatively large subscription, but as such a large firm often has its own scientifically trained staff it has the greater interest in any results of the more long-range work of the Research Association, since it can more quickly utilize these in development work by its own staff. The small unit usually finds difficulty in applying the laboratory results of the Research Association and therefore requires the more "developed" result from the staff of the Research Association. By the Articles of Association all results should be communicated to all members simultaneously. The outcome of all these considerations has been a further stimulus to the medium-sized units to include in their employ scientifically trained personnel.

I believe that one of the original aims of the Shirley Institute—to express it rather bluntly—was to develop measures of control so as to prevent elderly men carrying their experience to the grave. With regard to exact measurements of quality, and for control of processes, the Shirley Institute has become the scientific bureau for the trade, and should be in a position to advise upon the application of new scientific methods to industry. The Shirley Institute therefore wants an early chance of trying out any possible application of new scientific tools, so that any possibility of their usefulness may be brought quickly to the knowledge of the industry.

There is an example of this under the Lease-Lend arrangements. A new tool—the Electron Microscope—has been developed in America, although it was possibly devised but never developed at an early stage in this country. Under the Lease-Lend arrangements some six new electron microscopes, which are much more powerful than any other microscopes, have been sent to this country. The Government has sent one of them to the Shirley Institute in order that an attempt may be made to apply it to research work in connection with cotton, rayon and silk, as well as other industrial products dealt with in the North. I do not hold any views about its applications, not having yet had time to explore the possible uses of the new equipment. I merely mention this as an illustration of the fact recognized by the Governments of the United Kingdom and the United States that the central scientific bureau attached to an industry should have in war time an early opportunity of trying out a new scientific tool in order to ascertain if it can be applied to the industry.

A central research establishment for textile industries generally is essential. It is not to be expected that a

greater portion of the textile research work should be done in academic laboratories or even in works laboratories. Nearly all the textile fibers vary in their characteristics to some extent. They even vary among themselves, i.e. the fibers of a given type, certainly with the natural products, exhibit great variability. They show also a different behavior in the presence of the variable moisture of the atmosphere, so that reproducible experiments have to be done on an elaborate scale under atmospheric control and the number of experiments that have to be done in order to obtain a statistically significant result is very large.

These conditions are such that they do not lead easily to the conduct of that type of research I have in mind being effected except with the assistance of a large number of routine workers, and unless the experiments are carried out in a strictly controlled atmosphere.

Many questions have been raised concerning the slowness in the application of research results. The difficulty of getting the results of research translated from the laboratory to the mill is very great. In another connection, I think commercial people talk about a "sales resistance" and the resistance of the mill people to the carrying over of research results to mill practice can be very great. There is certain temperamental difficulty that is particularly expressed by resistance in the textile world.

Temperamentally, I suppose, most of us want an established order. We want to know where we are going. We do not want to have continual upsets. The maker of textile products has often a standard line. He does not want that upset. If he is at all successful with his product he has a sort of natural resistance to the disturbance introduced by new ideas until he is absolutely certain that the result is going to be something worth while—in fact a winner! He does not regard research and experimentation as a form of insurance against loss of or change in his markets.

This is perhaps illustrated by an experience I have had in dealing with our weavers. We have some 20 or 30 weavers in the experimental weaving shed at the Shirley Institute. They are supposed to be average workers. They are not specially selected. They are not paid in the ordinary trade way; they have a standing wage which is above what they would get, on the average, in the mill. They have from time to time quite pleasantly approached me and suggested that the wage should be higher. Well, there is nothing new about that; we are all used to people wanting more wages and more salaries; in fact, only at lunch time I was told that scientists were always wanting higher salaries! But the reason for our weavers wanting higher wages was that they were always being "messed about." They had not got a straightforward job. They did not always know in the morning what they were going to do. The machine could go on and on and on, but they were continually being interrupted by one of my scientific colleagues going in and suggesting that a slight experimentation would be advisable. They did not suffer in pocket from the interruption, but it annoyed them. They wanted to go on weaving "hammer and tongs" all the time, and because they could not do that they thought they were entitled to be paid at a higher rate.

Now that is quite a common experience. I have experienced it in other industries. It is a part of what I will call "sales resistance," to the introduction of research methods. It upsets the majority of people if they cannot go on pre-conceived lines to a pre-ordained destination.

As regards the Research Association movement, the difficulty from the beginning is that the resources put at the disposal of the research associations have always been insufficient. I merely mention this because if the Director of a Research Association is expected to produce value for money he must be in a position to know at what point it will pay best to direct the efforts of his colleagues. That means, to my mind, that the Research Association must be fully informed, and must thoroughly investigate, what I will term the economics of production. That is a phase, to my mind, which in the cotton, rayon and silk industries is not worked out with exactitude. I think it is most essential that there should be, at the Central Scientific Bureau of the industry, full information about the economics of production.

I am not talking about the economics of the production of raw material or about what is known as market research, but there is a vast field of economics in production which requires investigation, and with regard to which information must be available—if only to enable the slender resources of the Shirley Institute, for example, to be applied in the most reasonable way. The £100,000 a year that we are now spending is a mere fleabite for the three industries.

Then arises the question as to what is the position of the State. The Research Association movement was commenced at the end of the last war, when the State in order to encourage the application of Science to Industry offered the industrialists what some people called a bribe and others called a carrot, in the form of a State grant of £1-for-£1 for what the industry put up. Now I subscribe to the view that the industry will put up plenty of money when it can see that it is going to get results. But, there is a State point of view. If the truth of the premise I have been putting forward is admitted, namely, that it takes a very long time to put far-reaching results into practice, it follows that there will not be the same incentive on the part of the industrialist to pay heavily for research work which is going to affect his successors. I maintain that it is the State's function to ensure that an industry is, may I say, wide-awake enough to carry out and foster fundamental scientific research which, after all, is the basis of the industries of the future. From that point of view, I think that State aid is defensible and should be continuous. Incidentally, I may mention that the State has provided so far 20 per cent. of the total resources which have been provided for the Shirley Institute.

The Research Association movement in the textile industry is particularly important from another point of

view. The textile industries have been excessively sectionalized, not only as regards the various fibers, but even more so as regards the conventional processes. In connection with the proposed formation of a Rayon Federation, the various processors involved belong to no less than thirteen different associations, representing all sections of the industry.

The Research Association movement, as I see it, does tend to provide a connecting link between, say, the spinners and the finishers. It provides "vertical" knowledge, knowledge which should be available to the different sections of the industry from the choice of the raw material to its transition into yarn and into the grey and finished cloth. It provides a method of finding different reactions, or the variations, at any stage of the sequence in a way that the horizontal organization of the industry does not.

I wish to emphasize the part that the textile industry can play, or may be called upon to play, in the reconstruction period. I guess that there will soon be a time when England will have to play a very large part in the rehabilitation of Europe, and when America and ourselves will also be occupied in clearing up the mess in Asia.

The outlook, at the present time, is that the rehabilitation of Europe will be a job to be taken in hand before the second job is commenced. That means that we may have to provide fabrics for Europe. Now what are the prospects of the mass production of fabrics, having regard to the shortage of raw material, and, above all, a very restricted labor force? These considerations seem to me to apply not merely to textiles, but to many another industry. Therefore, I would plead that there is very great urgency for the development of the industrial research movement—a cooperative movement which has been useful in war-time for the national effort.

We have been seeing an innovation in the textile industries, as in other industries, namely, the insistence of the Board of Trade on what are known as utility standards: a minimum quality for a price ceiling. These utility standards are going to be in existence for some time, and it appears likely that the utility cloths will be used to re-clothe Europe at least at the start of the reconstruction period.

I look forward, therefore, to much more mass production than there has been in the past. From what has been happening, or is being proposed, by the various organizations concerned with the cotton and rayon trades, I see no reason why mass production methods should not be advantageously put into operation for our export markets when we can make a more determined attempt to get them back.

There have been tremendous efforts recently made by the Research Associations, and by the industrial firms possessing research laboratories, to overcome the shortage of material, and to provide answers to questions about Service requirements. In one sense, those of us who have been occupied in the field of research have had the time of our lives, because, in wartime, research results can be pushed into production for Service requirements which are just a little bit too expensive for ordinary commercial practice. Many of these innovations, however, will not survive because of their cost being uncommercial.

I would, however, point out that so far as the Shirley Institute is concerned, the State has had, to some extent, its money back. We have carried out very many researches for the Services. I think there have been nearly 700 separate enquiries made to all of which we have given an answer. We may not always have supplied the right answer, but I think we have supplied the right answer to a great many of them, though I am not going to delude myself into the belief that those answers will hold as right when we return to the conditions of a commercial world. What is bought by the Government at the moment is not necessarily the right answer to a commercial problem in peace-time.

I would like to refer to the coming development of plastics. The application of what are known as *synthetic* plastics to textiles will undoubtedly develop very largely in the near future. I do not know what is to be accepted as the definition of plastics. The man in the street has a very hazy idea about them. He looks at the various advertisements, and I am afraid he gets a very confused impression concerning them. The commonest pseudo-scientific definition of a plastic which I have read and which I think is best, is that a plastic is a material susceptible to deformation which it will retain under some conditions.

On that definition, cotton is a plastic; those who are familiar with the Schreinering process will realize that the cotton fabric undergoing that process is a plastic in the sense that it is susceptible to deformation, and that it retains the deformation which is impressed upon it by the process. Another case is the manufacture of calendar bowls in which cotton obviously behaves as a plastic, whilst cellulose acetate is commonly regarded as a typical plastic.

The discovery in America, by the brilliant team of chemists associated with E. I. du Pont de Nemours & Co., has led to the introduction of nylon, causing popular writers in the press to state that our clothing is going to be made of synthetic plastics, that our homes are going to be made of plastics, and that the natural products are going to take a back seat. That I do not believe for a moment, for the reason that there is a limited amount of raw material which can be used for a specific chemical purpose.

Take the present output of nylon, or of phenol-formaldehyde resins such as Bakelite, etc.; they all ultimately depend upon the use of a large amount of phenol. There will be obvious limits to the development of some of these things, dependent upon the amount of phenol available. There may not be enough to go round.

But irrespective of that, I cannot think that the working out of the principles of the Atlantic Charter could possibly result in the elimination of the natural fibers. After all, the people whose livelihood depends upon the

production of some of the natural fibers will have to live, and the "cash crop" of the agricultural inhabitant of some large portions of the world is cotton. As for Japan also, I do not see how total elimination of silk can be discussed in terms of the Atlantic Charter.

There have been many endeavors to use synthetic fibers, but there is still a long way to go. In 1938 or 1939—I am not quite certain which, but at any rate the year when the last statistics were available—as one of my colleagues has pointed out, the total production of man-made fibers only equalled the average annual fluctuation in the cotton crop of the world. Having said that, and having expressed the opinion that the natural fibers will play a persistent part in the production of textiles for the world population, let me emphasize again that the making of a fabric for a specified purpose will be dependent in future upon the right choice of materials. I am by no means claiming that a natural fiber is as good in some characteristics as some synthetic fibers, which in turn are often deficient in certain characteristics of the natural fibers with which they aspire to compete. To express it popularly, any fiber in general use possesses some little something which the others have not. It is the choice of these characteristics, relatively to their price, which will determine the relative consumption of the different fibers.

Let me conclude on a personal note. I have not stood before you as a "Mather" lecturer in a white sheet of repentance or apology for the Shirley Institute. Those of you who know me well will not have expected me to do that. Rather, I would emphasize the main point of my discourse by pointing out that your "Mather" lecturer of 1943 has stood before you in woolen socks, staple fiber pants, reinforced in their weakest parts by cotton cloth made from American cotton, wearing a singlet composed of Egyptian cotton and real silk, as a non-irritant for a delicate skin, the whole discreetly covered by (*a*) a pair of shoes, which contain as a lining a coarse Indian cotton cloth, are sewn with linen threads and furnished with mohair laces, (*b*) a mercerized Egyptian cotton poplin shirt, (*c*) a linen collar for comfort with a crease-resisting rayon tie for economy, and (*d*) a warm worsted suit decorated with a silk pin stripe and furnished with a not inconspicuous but very absorbent linen handkerchief!

The President: Sir Robert, I am sure I am voicing the wish of everyone present when I thank you for your Address. None of us can study any aspect of textile technology without coming across the names of yourself and of the famous Shirley Institute. If I may be permitted to say so your Address is well up to the high standard we have come to expect from our "Mather" lecturers who deliver the most important lecture of the year from the point of view of the Institute. When I look round the meeting this afternoon I see a number of responsible men from the textile industry present, most of whom can ill-afford the time to be away from their daily affairs; but I am sure they will all consider their time has been well spent while listening to you.

SMALL TEXTILE PLANT POWER TESTS

W. F. Schaphorst, M.E.

OPERATORS of textile mills sometimes have occasion to check electrical power. If the power is purchased from a central station it is usually well to know whether all of the power paid for is received or utilized. If you manufacture your own electric power, on the other hand, or a part of it, you will again want to know all of the facts, particularly if the total annual amount is considerable.

For this purpose the graphic wattmeter is the most widely used. It measures loads and shows the loads graphically making the facts readily understood. It assists in analyzing machinery. Thus if a certain machine is giving you trouble the graphic wattmeter will probably show just what is wrong or will indicate how the trouble can be eliminated. If a machine is used intermittently the graphic wattmeter shows when the machine is used, how often, and it shows the load at each using. It is by far the most versatile and useful of all electrical instruments.

For instance, one large and well known producer of food products effected a saving of over $10,000 per year by making a thorough study of its electrical power. It was found that a surprising percentage of the power was lost in grounds. The power factors were not good and were improved. Individual motors were studied and machine operation improved throughout the plant.

Thus in one instance they were using a 25 h.p. motor to drive a special "shaking machine" for salvaging and cleaning bags. The investigation proved that the motor was entirely too large for the machine it was driving. They are now driving that machine with a 1 h.p. motor instead of the 25 h.p. motor. A 1 h.p. motor not only costs much less, but when operating at full load it is much more efficient than is a 25 h.p. motor pulling only one h.p. as your electrical tables will tell you at a glance.

Operators of small plants are inclined to say, "That is all very well for big plants. But we don't use nearly that much power. We doubt whether it will pay us to buy a graphic wattmeter."

That, of course, is an important point. But in general it is a small plant indeed that cannot afford to do any checking up of power once in a while. It may not pay you to buy a wattmeter, true, but if there is a testing engineer or specialist in your vicinity who is equipped with apparatus for such work, his charge for making the test and the possibility of more than saving that cost might be worth discussing with him. If his charge would be $25 and if you might save $100 per year as a result—would that be worth while to you? Your losses may be much higher than you think, particularly if you have no way in which to conduct an occasional test yourself. A graphical wattmeter is an excellent tool to have at your fingers' ends.

PROCEEDINGS OF THE

American Association of Textile Chemists and Colorists

SEPTEMBER 13, 1943

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Members should notify the **Secretary** immediately of all address changes.

REPORT OF NOMINATING COMMITTEE

THE Councilors representing Sections, in their capacity as Nominating Committee, have directed the Secretary to report the following nominations for the election of 1943:

For President, William D Appel

For Vice-President, Hugh Christison

For Vice-President, Charles A. Seibert

Under the Constitution, additional nominations, each signed by at least twenty-five Senior members, filed with the Secretary not later than October eighth, will be given equal standing on the ballot.

Respectfully submitted,

HAROLD C. CHAPIN, *Secretary.*

CORRECTION

Price of Test Cloth

In the "Report of Committee on Fastness to Dry Cleaning" which was published in the issue of August 16th, there appears on page P364, under the heading "Reference Details," first paragraph, last sentence, the statement "This type of cloth may be obtained from the American Woolen Company, Andover, Mass. (style DD-8370: price, January, 1939, $2.37½ per yard, 60 inch width)." The latter part of this sentence should read: "price, May, 1943, $2.87½ per yard, 60 inch width."

• CALENDAR • OF COMING EVENTS

Meeting, Southeastern Section, Atlanta Athletic Club, Atlanta, Ga., September 18, 1943.

Meeting, Rhode Island Section, Providence Engineering Society, September 24, 1943. Speakers: C. M. Marberg and E. F. Fullam, Interchemical Corp., "The Electron Microscope in Pigment Research," illustrated by slides and a sound film.

Intersectional Contest, in conjunction with New York Section Meeting, Downtown Athletic Club, New York City, October 22, 1943.

Council Meeting, New York City, October 22, 1943

INTERSECTIONAL CONTEST PAPER, NEW YORK SECTION

THE NEW YORK SECTION is actively engaged in the preparation of the paper it will present at the Intersectional Contest to be held at the Downtown Athletic Club, New York City, on October 22nd. The Contest Paper Committee is working under the direction and supervision of Emmett Driscoll of the Sayles Finishing Plants, Inc. Mr. Driscoll is vice-chairman of the New York Section, was chairman of the technical program committee last season and served as a member of the Contest Paper Committee for the last two seasons. The personnel of the committee follows:

Emmett Driscoll

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Dr. Hugh H. Mosher,
Onyx Oil & Chemical Co.
Kenneth L. Dorman,
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Managing Editor

VOLUME 32 | SEPTEMBER 13, 1943 | NUMBER 19

LET'S MAKE IT A PERSONAL FIGHT!

THIS month will witness an event heavy with significance. In many ways it will transcend, because it will determine, political and military events on both home and battle fronts. It is likely to have a profound influence upon the length of the war—involving the sacrifice of men, property and perhaps the state of our future form of government.

This month the Government requests from its individual citizens the voluntary investment of $15,000,000,000, the largest financing program in the world's history.

The response will spell out answers to questions in the minds of our own people, in those of our Allies, and, more important, in those of our enemies.

Dollars in this case speak louder than lips, than parades, than resolutions, than Acts of Congress. Earnest money is a time-honored phrase among all peoples. It is a pledge; it is a token of determination. It comes from our sweaty labor of today, or from the result of our labor of yesterday. A voluntary out-pouring of dollars will drive down the morale of Jap and Hun more quickly and definitely than the drafting of a million sons and fathers.

We Americans boast of our freedoms. We exhort other unhappy peoples to note and take hope. We set up our freedoms of choice, our voluntary methods against the disciplines and compulsion of dictatorial regimes.

Today we face an obligation, an obligation to pay. We cannot endure as an insolvent republic. That way dictatorship lies. Liberal goverments are wrecked on the shoals of loose fiscal policy.

If we do not meet voluntarily this war obligation, what then?

The alternative? Forced loans and forced labor. If voluntary financing fails, make no mistake, compulsory financing will follow quickly. But the fear of forced buying and even capital levies is to put the case upon a gross material basis. The fear should be in the loss of that freedom of choice which we are defending and which we promise to our vanquished foes.

Upon the business man of a thousand communities will fall the brunt of the task. Contrary to the demagogues and wise-crackers, he is the man a community looks to for counsel and example in matters financial. His reasonings, we are led to believe, when he invests his money, are based upon wisdom and not emotions.

His example as a bond-buyer will mean much.

The business man is an organizer. He knows how to assay and reach markets. He then knows how to present his wares attractively and honestly—thus convincingly. He knows how to reach customers efficiently and economically of time. He knows how to build men and women into a team, to see the job as a whole, to delegate duties and responsibilities, to direct and, in all, to encourage.

His experience in helping to organize for this effort will mean much to his community, and the nation.

Great news, indeed, if the announcement should come around October 1, that Tokyo had been successfully bombed, that Italy was training her guns on Germany, that Allied soldiers were marching against Berlin from the mainland. But the best substitute for such a morale-building event for us, and most destructive of enemy morale, will be the announcement that the hearts and will and sinews of the American people are in this war to the finish.

A September war bond proudly pocketed by 40,000,000 Americans will chill the zeal of the war lords of Japan and Germany. And it will create a fighting spirit at home, a determination to win completely and quickly, that will carry us surging forward in our resolve to build, post war, a better world in the tradition of free America.—Merle Thorpe in *Nation's Business.*

THE QUESTION OF SCIENTIFIC MEETINGS

MANY scientific meetings during the past year were canceled at the request of the Office of Defense Transportation because of the great congestion of traffic on the railroads. Since the time for making preparations for scientific meetings next autumn and winter has arrived, officers of scientific societies are anxiously raising questions regarding the possibility of holding them this year.

Under date of July 15, Joseph B. Eastman, Director of the Office of Defense Transportation, issued a release on the holding of scientific meetings during the remainder of the war period. In this release appear the following paragraphs of special interest to officers of scientific societies:

"The present huge volume of passenger traffic is taxing the capacity of the railroads and bus lines. Equipment to handle additional traffic cannot be obtained. The volume of military travel, moreover, is rising and will continue to

rise. More than one-half of all Pullman sleeping cars, about one-third of all railroad day coaches, are now needed all the time to handle organized troop movements in special trains and special cars. The number of cars needed for troop movements is increasing. Facilities for accommodating civilian rail travel are decreasing.

"The Office of Defense Transportation has consistently discouraged travel-stimulating events and all unnecessary civilian travel. With essential travel demands increasing, and with an outlook for continued increases in future months, our responsibilities permit no other policy. Maximum conservation of passenger travel facilities for the duration of the war is necessary to enable the railroads and bus lines to discharge their military and essential business travel responsibilities. . . .

"I know that provisions of the constitutions or by-laws of some organizations stipulate the holding of annual conventions, and that cancellation of the meetings may raise complications with regard to the tenure of officers and other matters. However, this is wartime. The emergency calls for emergency procedure. The action of many organizations in cancelling conventions required by a literal reading of their governing rules indicates that such obstacles to compliance with the ODT request for cancellation can be surmounted where there is full appreciation of the pressing nature of the emergency and a real desire to cooperate.

"The fact that one organization or another has adhered to its convention plans does not give other organizations a valid reason for thinking they should do likewise. Each organization must make its own independent decision. The Office of Defense Transportation cannot pass upon the essentiality of any proposed meeting. It can only emphasize the serious burdens which convention and group-meeting travel imposes on transportation and request voluntary action by those who have it in their power to eliminate such travel."

In substantiation of Mr. Eastman's statement about the continued congestion of passenger traffic on the railroads of the United States, the operating statistics for June of this year, as reported in the daily papers, shows that the passenger revenues were considerably higher than they were in June, 1942. Since it has been impossible, during the war period, to produce a large number of new railroad locomotives or passenger coaches, the burdens of passenger traffic on the railroads have been increasing and are not likely to decrease until the war passes into an entirely different stage.—*Bulletin of the American Association for the Advancement of Science.*

* * *

In keeping with the spirit as well as the letter of this request, the American Association of Textile Chemists and Colorists not only will not hold its annual convention this year, but cancelled the convention which was scheduled to be held in October of 1942. It is to be regretted that the technical program which was planned for that convention could not be held, because it was to have been devoted entirely to the technical aspects of the nation's war effort insofar as the textile industry is concerned. However, in view of transportation difficulties and in response to the suggestion of Mr. Eastman in 1942, the council of the A.A.T.C.C. voted to cancel that meeting.

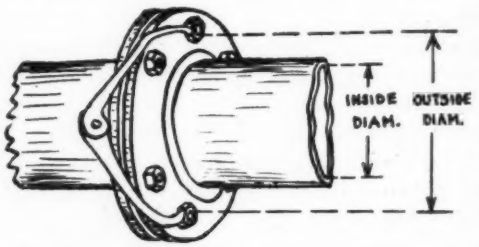
The Association has been fortunate in having an alert council and a progressive research committee which have continued to meet and plan the activities of the parent body. Sections have continued to hold meetings in their local vicinities and the holding of the Intersectional Contest, before a section meeting, has also served to partially substitute for the annual convention. All of these activities have been reported and will continue to be reported in the Proceedings so that each member may keep himself informed of the accomplishments of the Association as a whole.

It is to be hoped that the day is not too far distant when a combined victory celebration and annual convention of the A.A.T.C.C. may be held.

HOW TO MEASURE FOR A GASKET

W. F. Schaphorst, M.E.

CONTRARY to the common belief, it is not necessary to take a flange apart in order to measure for a gasket. Measurements may be accurately made from the outside as indicated by the accompanying sketch. By means of a pair of calipers take the distance from the inside of one bolt to the inside of the bolt diametrically opposite. This gives the exact outside diameter of the gasket.



For the inside diameter, either measure the inside diameter of the pipe, as shown, or consult a handbook giving the inside and outside diameters of standard pipe. The table will give the exact inside diameter. The inside diameter of the gasket should be the same as the inside diameter of the pipe so that no water or gas pockets will be formed.

The above method is better and quicker than the one usually recommended, namely, to measure from center to center of the bolts and then subtract the diameter of the bolt. No error can be made if the above method is followed.

When ordering a gasket it is usually best to give the "exact" dimensions, particularly the exact distance between bolts, so that the manufacturer can furnish a gasket of the correct size. He will probably deduct 1-32 or 1-16 of an inch. It is better to leave the deduction to the manufacturer than to do it oneself.

OBITUARY

CLARENCE J. HUFF

CLARENCE J. HUFF, Vice President in Charge of Sales of Procter & Gamble, Cincinnati, Ohio since 1938, died very suddenly at his summer home at Hampton, New Hampshire, August 17. His death closed a career of 53 years with the Company.

Clarence J. Huff

In 1890, Mr. Huff joined Procter & Gamble as an office boy and clerk in the Boston Sales Office. In 1896, he became a retail salesman, travelling throughout New England. He later went to New York as a Jobbing Salesman and came to Cincinnati in 1912 as Manager of the Central Sales Division. In 1927, he was named Manager of the Case Goods Sales Department, in 1932, General Sales Manager and later, Vice President in Charge of Sales.

CARL H. HAZARD

CARL H. HAZARD, President of the advertising agency bearing his name, died at his New York City residence at 52 West 53rd Street, on August 23rd after an illness of more than a year. Born in Stamford, Conn., he was 49 years old.

Mr. Hazard was widely known in the chemical and industrial advertising fields for more than 22 years. His entire business career had been in sales and advertising activities. While in his early twenties, Mr. Hazard was Sales and Advertising Manager of the American Synthetic Color Company, later joining the H. A. Metz Laboratories, Inc. as Advertising Manager, in which capacity he served until he joined the U. S. Army Chemical Warfare Service during the first World War. It was immediately after the war, in 1920, when Mr. Hazard founded the Hazard Advertising Corporation, New York, drawing upon his background of sales and advertising experience to establish a nucleus of accounts on which he built his advertising agency.

Mr. Hazard was a member of the American Chemical Society and the Chemists' Club.

• SAFETY OF WAR WORKERS

World War II is a lot safer than World War I for the American war worker, according to the 1943 edition of "Accident Facts," the statistical yearbook of the National Safety Council.

Deaths per 100,000 workers in the current war are one to one and a half times less than fatalities to war workers in 1917-18, the Council said. The Council also pointed out that the increase from 1941 to 1942 was much less than the rise in deaths from 1917 to 1918.

Railroad workers are twice as safe today as were their predecessors in the last war, and injuries to these workers are only a third as great as a quarter of a century ago.

Agriculture took the heaviest toll last year among war workers, with 4,400 deaths. Trades and service were next with 3,500, followed in order by construction 3,100, manufacturing 3,100, transportation and utilities, 2,500 and mining, quarrying, oil and gas wells, 1,900 deaths.

Occupational fatalities decreased by 200 in the first four months of the present year, as compared with the same period in 1942.

• HIGH-DENSITY COTTON BALES

The origin, stocks, and distribution of American high-density cotton bales, the feasibility of using such cotton in American mills, and the effects of high-density compression on spinning quality are among the subjects discussed in a special report entitled "High-Density Cotton in American Mills," just distributed to its members by Textile Research Institute, Inc. The subject is of present concern to cotton ginners, compression, and transportation interests, as well as manufacturers.

In the preparation of this report the experience of manufacturers was drawn upon to show the nature, extent, and possible solution of the technical difficulties involved. Prior to the war most American mills had had no experience in handling high-density cotton, and questions similar to the following have been and are being asked: Can high-density cotton be processed on equipment previously used for low- or standard-density cotton? What modifications in handling methods or in machine adjustments need to be made to accommodate high-density cotton? What is the ideal machinery set-up for running high-density cotton? Does compression to high-density affect the quality of cotton adversely? The answers to these and other questions will be found in this report. Inquiries concerning the availability of the report should be addressed to the Textile Research Institute, Inc., 10 East 40 Street, New York, 16, N. Y.

• 1944 SPRING WOOLEN AND RAYON COLORS

The 1944 Spring Woolen and Rayon Collections, just issued in confidential swatch form by The Textile Color Card Association to its members, have been created with the double purpose of saving dyestuffs and at the same time providing the fashion industries with stimulating new colors.

Adhering to the Association's established wartime ruling, all colors in these collections have been passed upon by its Dyestuff Advisory Committee. In firm support of the government's conservation program, it was explained by Margaret Hayden Rorke, managing director, there is a very definite lightening of all tones in both collections and a reduction in the number of colors has likewise been effected by incorporating in the rayon group twelve prototypes of the woolen shades under the same names.

• LEAVE OF ABSENCE

Mark Upson, Manager of the Eastern Sales Division of Procter & Gamble, has been granted leave of absence from the Company. He has been named Director of the Transportation Division of the War Food Administration. His work will include co-ordination of transportation for all War Food Administration agencies.

• BUYS DOPP KETTLE RIGHTS

The entire line of DOPP Kettles, formerly built by the Sowers Manufacturing Company, have been acquired by the Buffalo Foundry & Machine Co., Buffalo, N. Y., who will continue production. The engineering, manufacturing and sales personnel have been retained.

DOPP Kettles, in their 40 years of active service to the Process Industries, have been extensively used for heating, cooling and mixing. The various types include Seamless Jacketed and Single Shell Kettles, Mixers, Soap Crutchers, Vacuum and Pressure apparatus. Exclusive DOPP features are said to be one-piece body construction and scraping agitators, designed to speed production through improved heat transfer.

The Buffalo Foundry & Machine Co. who are widely kown throughout the Chemical, Process and Food Industries as designers and builders of Buflovak Dryers, Evaporators and Chemical Plant equipment, will continue to manufacture their former processing kettles. In adding the DOPP equipment, a complete line of standard type Kettles are now available, with various combinations of agitators and drives for practically every application.

• NEW PADDER-MANGLE

The Textile Machinery Division of the Rodney Hunt Machine Company, Orange, Mass., has recently brought out a new Padder-Mangle which they state has several unique features not heretofore available in this type of machine.

The new Rodney Hunt Padder-Mangle is an extra heavy duty pneumatically controlled unit which provides operating pressures from 0 to 30,000 pounds.

A unique feature of the machine is the arrangement of the rolls at an angle rather than having the top roll directly over the bottom roll. This feature, according to Rodney Hunt, insures a greater uniformity of padding and dyeing, eliminating the deeper shades on the selvage which is a frequent source of trouble on ordinary machines.

Another exclusive Rodney Hunt feature is applying the pneumatically controlled pressure to the bottom roll rather than the top. By making the bottom roll removable it allows this roll to drop out of contact with the fabric by gravity when in operation and thus eliminates the need for continuous air pressure in order to keep the rolls out of contact.

• APPOINTED LICENSEES

The American Viscose Corporation announces the appointment of six additional companies as finisher licensees under the "Crown" Tested Plan. The companies are All Tex Finishing Co., Inc., New York, N. Y.; Beacon Piece Dyeing & Finishing Co., Beacon, N. Y.; Bradford Dyeing Association (U.S.A.), Westerly, R. I.; Capitol Piece Dye Works, Inc., Garnerville, N. Y.; North Carolina Fabrics Corporation, Salisbury, N. C.; and Pleasant Valley Finishing Co., Inc., Pleasant Valley, N. Y. Each of these companies is fully qualified to dye and finish rayon fabrics in accordance with the high standards established under the "Crown" Tested Plan.

• ASBESTOS FABRICS PRODUCTION

United States Rubber Company will increase by 50 per cent its capacity for the production of asbestos fabrics used principally in war products, it was announced recently by Herbert E. Smith, president.

The material is used in the manufacture of fire-fighting suits for the Army and Navy Air Forces, air ducts for both the heating and de-icing of bombers and fighter planes, insulating tape for naval cable and electrical apparatus, and other products vital to the war effort.

"Our company has developed a new method of spinning asbestos fibers into fine yarns," Mr. Smith said. "Fabrics made from these yarns, known as Asbeston, are extremely lightweight. For example, fire-fighting suits made of it weigh only one-half as much as suits of conventional asbestos fabrics. These suits, which are standard equipment aboard aircraft carriers, and at Army air bases, facilitate the fighting of fires and rescues from fire. Likewise, the lightness of the material makes it ideal for use in air ducts and other equipment on planes, and it replaces critical metals."

Mr. Smith said the company would increase its production 50 per cent by expanding the asbestos facilities of the Stark Mills, operated by the company's textile division in Hogansville, Ga.

Many new and unusual applications for this new type of asbestos textile are anticipated by the company in the postwar market.

• APPOINTED ASST. GENERAL MANAGER

The Calco Chemical Division, American Cyanamid Company, announces the appointment of Sidney C. Moody as Assistant General Manager in charge of all departments of the Division.

Sidney C. Moody

Mr. Moody joined the Calco organizationin 1919. For many years he has been a Department Sales Manager where his activities have covered all phases of the business of manufacturing and selling organic chemicals and dyestuffs.

He was born in Evanston, Illinois on November 13, 1895. His education includes an A.B. from Williams where he graduated in 1917. From 1918 to 1919 he was a Second Lieutenant in the Field Artillery of the U. S. Army. He was married to Frances T. Glenn of Montclair, New Jersey on May 7, 1924. They have two children, Mary Aileen and Sidney, Jr.

• MANAGER, DEVELOPMENT AND RESEARCH DIVISION

Appointment of T. H. Wickenden as Manager of the Development and Research Division of the International Nickel Company and H. J. French as Assistant Manager is announced by Robert C. Stanley, President of the Company.

Mr. Wickenden, who has been Assistant Manager of the Division since 1931, succeeds the late Albion James Wadhams. He is well known in engineering circles in the automotive industry, having been in charge of engineering at Studebaker Corporation's South Bend plant from 1913 to 1920. Mr. Wickenden joined International Nickel in 1922 when he was placed in charge of developments in the automobile field for the Development and Research Department at New York. Numerous inventions connected with the use of nickel in cast iron are credited to him and his papers and engineering data sheets on the use of nickel in steel and cast iron have been widely published in trade journals.

• NEW STAFF ADDITIONS

Chemical Developments Corporation, Dayton, Ohio, has announced the following recent additions to its technical staff: Melvin A. Crosby, chief engineer; Gordon M. Williams, John R. Fisher, Jr., and Elizabeth D. Strickland, research chemists; and Dr. Lena Ranis Ziegler, patent chemist.

• NEW A.A.P. OFFICE

American Aniline Products, Inc. has opened a new office at 1019 South Grand Ave., Los Angeles, California.

• PRODUCTION ORGANIZATION DIVIDED

To achieve greater efficiency and because of continued expansion and diversification of output, the production organization of the American Viscose Corporation has been separated into two divisions, one to handle viscose rayon and the other to have charge of acetate rayon and "Vinyon", it was announced recently.

George M. Allen, formerly in charge of all production, will be head of the Viscose Division, while Henry H. Bitler,

previously the corporation's assistant technical director, will be in charge of the Acetate-"Vinyon" Division.

This change is to a large extent a result of the continued expansion of the company's activities, which has made the supervision of both viscose and acetate rayon production too complex to be handled with maximum efficiency by a single division.

• NAVY'S NEW UNIFORM COLOR

At the special request of the Navy Department, The Textile Color Card Association has just issued for distribution to industrial channels, the official standard for United States Navy Grey, which the Navy has recently adopted and which is to be used for Commissioned, Warrant, and Chief Petty Officers summer working uniforms and enlisted men's grey undress jumpers, grey trousers and peaked caps.

The standard specification for this new grey, as approved and accepted by the United States Navy, is portrayed on a small card in the actual fabric used by the Navy for the aforementioned specific purposes. This grey replaces the khaki color formerly worn by the Commissioned, Warrant, and Chief Petty Officers for summer working uniforms and likewise replaces the long-established white used for enlisted men.

The card showing this new Navy Standard Grey, can be procured from The Textile Color Card Association, at 200 Madison Avenue, New York.

• PRESIDENTIAL DINNER, S.C.I.

Foster D. Snell, Chairman of the American Section of the Society of Chemical Industry, announces the following committees for the Presidential Dinner to be held on October 22nd at the Waldorf-Astoria for Wallace P. Cohoe, newly elected President of the S. C. I., an organization of international scope.

The Honorary Dinner Committee consisting of Marston T. Bogert, Thomas Midgley, Charles L. Parsons and Maximillian Toch will have James Bryant Conant, President of Harvard University, as Chairman.

On the Publicity Committee with Walter Murphy, Editor of *Industrial and Engineering Chemistry* as Chairman, D. D. Berolzheimer, F. J. Curtis, Gustav Egloff, S. D. Kirkpatrick, J. L. K. Snyder, R. L. Taylor and E. C. Williams will serve.

Walter S. Landis, Vice President of American Cyanimid Company heads the Speakers Committee assisted by Lawrence W. Bass, W. A. Gibbons, H. D. Smith, G. M. A. Stine and A. J. Weith.

Walter J. Baeza is Chairman of the Dinner Committee which consists of E. R. Allen, Robert Calvert, Ralph Evans, Robert Heggie, J. W. H. Randall and W. D. Turner.

The Ways and Means Committee with S. D. Kirkpatrick, Editor of *Chemical and Metallurgical Engineering,* as Chairman is supported by G. DuBois, J. V. N. Dorr, C. R. Downs, W. W. Duecker, C. N. Frey, R. E. Gage, R. E. Gruber, D. B. Mason, J. G. Vail, L. W. Waters, W. B. Weigand, L. T. Work.

Dinner reservations will be handled by J. W. H. Randall, 50 East 41st St., New York.

• COMMITTEE ON ECONOMIC RESEARCH

The appointment of Robert R. West, president of the Esmond Mills, as chairman of its Committee on Economic Research, and the selection of the members of that committee have been announced by the Textile Research Institute, Inc. The chief function of the committee will continue to be to recommend to the Institute important projects in economic research and to supervise their production.

Robert R. West

In discussing the work of the committee, Mr. West said, "The amount of economic research to be done in industry is well appreciated. It is hoped that this committee will be useful in bringing this subject into focus and successful in arranging for significant studies to be made."

In its ten-year history, the Committee on Economic Research of the Institute has won considerable recognition for its activities, particularly for recommending and guiding the preparation and publication of two notable reports which were financed by the Textile Foundation:

1. "Vertical Integration in the Textile Industries", Industrial Research Department of Wharton School of Finance and Commerce, University of Pennsylvania, 1938.

2. "Inventory Policies in the Textile Industries". Seven monographs. Industrial Research Department of the Wharton School of Finance and Commerce, University of Pennsylvania, 1941.

In addition to Mr. West the members of the Committee are: F. W. Binzen, merchandise manager, J. C. Penney Co., Inc.; Miss Irene L. Blunt, executive secretary, National Federation of Textiles; Flint Garrison, publisher of *Garrison's Magazine,* and former president of the Wholesale Dry Goods Institute; A. Ford Hinrichs, Acting Commissioner of Labor Statistics, U. S. Department of Labor; L. A. Hird, Treasurer, Samuel Hird & Sons; Luther H. Hodges, vice-president, Marshall Field and Company, Stanley B. Hunt, editor, *Rayon Organon* and president of Textile Economics Bureau, Inc.; Lt.-Colonel Stephen J. Kennedy, in charge of the Textile Branch, Research and Development Division, Quartermaster Corps, U. S. A.; H. E. Michl, economist, Cotton-Textile Institute; and Douglas G. Woolf, editor, *Textile World.*

Referring to Mr. West's acceptance of the chairmanship, F. S. Blanchard, Institute president, said, "The Institute is most fortunate in securing Mr. West as head of this committee. Not only is he one of our leading mill executives; he was for several years Director of the Bureau of Industrial Research at the University of Virginia. Mr. West has long been an exponent of economic research within the industry. He and his committee are in a position to guide the Institute toward the most effective use of a form of research certain to become increasingly vital to the welfare of the textile industry."

A graduate of Harvard in the Class of 1915, Mr. West started as an apprentice in the textile industry the next year. He has been associated with the Lawton Mills, the Roxbury Carpet Co., the Lancaster Mills, and, from 1930 to 1940, with the Riverside and Dan River Cotton Mills. In 1940 he was appointed director of the Bureau of Industrial Research at the University of Virginia. In December 1942 he became president of the Esmond Mills, Inc.

• CONVERTER LICENSEES

The American Viscose Corporation announces the appointment of William T. Knott Co., Inc., and Albert H. Vandam Co., Inc., both of New York, N. Y., as converter licensees under the "Crown" Tested Plan. These companies are merchandizing fabrics that are approved to carry the green (washable) "Crown" Tested tag or label. This label means that the fabrics are washable in a washing machine at home or in a commercial laundry. Requirements for fabrics that can carry the green label include launderability at 160°F., 40 hours Fadeometer light fastness, and high resistance to both

acid and alkaline perspiration. Dimensional restorability, or resistance to shrinkage or stretching, can not exceed 2 per cent.

• NEW HERCULES DIVISION

Hercules Powder Company has announced the establishment of a Sales Research Division to investigate new markets for Hercules chemical products and to study the needs of industries served by the chemical company.

Dr. John H. Long will be in charge of the new division, P. W. Meyeringh, Hercules vice-president, said. He explained that the new division has resulted from Hercules' sales expansion in recent years into dozens of new industrial fields.

Dr. Long, a graduate of Johns Hopkins University, has been with Hercules for ten years, specializing on various technical problems involved in marketing Hercules products.

• VINYON FILTER CLOTHS

Acid-resistant filter cloths made of "Vinyon", the vinyl resin yarn manufactured by the American Viscose Corporation, are said to be proving of value in the production of many vital war materials such as high-octane gasoline, synthetic rubber, explosives and dyestuffs. The Government is currently the largest single user, but industrial concerns are also being supplied.

A number of production economies are made possible as a result of Vinyon's high resistance to acids and alkalies. It is stated that Vinyon cloths usually give a longer period of continuous service and the continuity of production thus made possible, together with the labor savings resulting from fewer filter changes, offer definite advantages to the chemical, pharmaceutical, and dyestuffs manufacturing industries, as well as to many types of laboratories. Sulfuric, nitric and hydrofluoric acids, aqua regia, caustic soda, potash, and many other equally destructive substances can be successfully filtered on a continuous basis through Vinyon fabrics.

Vinyon filter cloths have been successfully employed in dyestuff and dye intermediate production, in the manufacture of pigments and dry colors, and in the alkali manufacturing industry. Another important application for them is in the removal of solids from concentrated caustic solutions.

An interesting type of industrial utilization for Vinyon filters is in electrochemical processes, where they serve to keep plating solutions in condition. Anode bags of Vinyon cloth cover the anode and prevent particles from entering the solution.

In other branches of metallurgical manufacture, and in the refining of metals where acid solutions are reclaimed and filtered, the synthetic fabric filter is also getting work to do. It is likewise employed in meeting the lime sludge problem in paper and pulp plants, and in filtering bleach liquors in that industry. For certain applications in the manufacture of ceramic materials, where clay must be filtered, the Vinyon fabrics are now said to offer a number of advantages.

• HOSIERY SALVAGE TO CEASE

One of the first wartime salvage drives to reach its final goal will be completed September 30, when the collections of used silk and nylon stockings are to be discontinued, the War Production Board announced today.

Though receipts of hosiery continue to be remarkably large, it has been decided to wind up the campaign because the proportion of silk and nylon to the total poundage collected is on a declining scale. This is due largely to the fact that little or no hosiery of silk or nylon has been manufactured for the past several months.

In announcing the last date for receiving hosiery from the public, Paul C. Cabot, Director of WPB's Salvage Division, said: "The appeal has brought one of the greatest public responses thus far given to any Government-sponsored campaign of volunteer contributions to aid war production.

"A total of over 46,000,000 pairs of stockings, weighing more than 2,300,000 pounds, has already been collected and September collections are expected to swell the amount substantially."

Department and other retail stores will maintain their collection depots throughout this month. Remaining contributions should be brought in not later than September 30, for no hosiery can be accepted after that date, WPB pointed out.

Silk and nylon collected has been used in the manufacture of powder bags, parachutes and other equipment.

• TWO DIRECTIVES WITHDRAWN

Withdrawal of two War Production Board directives, now that their purpose has been fulfilled, was announced by the Textile, Clothing & Leather Division.

Both directives were issued on May 5. One provided for an increase in the production of Army herringbone twill to meet Quartermaster purchases for the last half of this year. Current procurements have been completed.

The other directive was designed to convert certain looms in bed sheeting mills to the production of Army raincoat sheeting. Quartermaster procurements of these items have been met for the time being.

The Textile Division pointed out that the mills involved will again be obligated to make the herringbone twill and the raincoat sheeting if a need for additional amounts arises. It was added that if such a need develops, the Division hopes that the conversion will be on a voluntary rather than mandatory basis.

• GERMAN TEXTILE INTERESTS

Big business interests in Nazi Germany, operating quietly behind the scenes of the terror, have captured practically the entire textile industry of Europe, the Office of War Information has revealed in the latest of a series of reports showing how a small group of big bankers and industrialists in Germany have obtained monopoly control over the wealth, trade and industry of Europe. This monopoly is believed powerful enough to survive internal changes in the political leadership of Germany.

Biggest profits from the Nazi plutocrats' looting and exploitation of the textile business have gone to two German cellulose firms: *Phrix A. G.* and *Zellwolle Ring.*

Phrix has taken most of the Norwegian and Dutch "Cellwool" (synthetic fiber) industry. *Zellwolle* has swallowed up the Belgian and French textile industry. *I. G. Farbenindustrie,* the German dye trust, is also getting a big cut in the textile business, chiefly in southeastern Europe.

All of these companies are typical German enterprises in that controlling interests are shared by high Nazi party officials and old-line German industrialists who supported Hitler in the early days of the Nazi party.

Quisling enterprises in occupied Europe have facilitated the absorption of their nation's wealth by the German monopoly and they too are getting some part of the profit.

In Norway, *A. S. Borregard* "co-operated" with Phrix to establish the first "cellwool" concern: the *A. S. Norsk Celluldfabrik.* In the Netherlands, the firm of *Algemeene Kunstszijde Unie N. V.,* which controls most of the Dutch and part of the Spanish artificial fiber production, "co-operated" with *Phrix.* In Spain, *Phrix* holds 26 percent of the shares of the newly-founded *Fabricascion Espanola de Fibras Artificiales S. A.* The Miranda factory, set up by this company, is due to start production in the fall of 1943.

Zellwolle Ring, which operates the most important textile companies in central and western Germany, has participated in establishing *S. A. France Rayonne,* founded

with a capital of 500 million francs. This company's new factory at Roanne is said to produce 100 tons of synthetic fiber a day. In Belgium, *Zellwolle Ring* works closely with the *Societe Belge de Fibranne*, a new subsidiary of the *Union des Fabriques Belges de Textiles Artificiels S. A. (Fabelta)*.

I. G. Farben exercises its major influence in Slovakia through *Dynamit Nobel*.

German synthetic fiber interests are now turning to Nazi satellite nations in southeast Europe as a potential field for "cellwool" production. Three big German companies—*I. G. Farben, Phrix,* and *Bemberg*— have founded a corporation in Berlin to investigate the possibilities of Rumania in this direction. In the summer of 1942 a German corporation made a deal with the Bulgarian corn monopoly for the use of German patents in the production of fibers. In Croatia, a new company, *Albert Industrieund Handelsgesellschaft A. G.,* was founded to produce synthetic fiber from domestic raw materials. Both German and Italian interests are exploiting the resources of this country; both have set up new factories in Croatia for the production of artificial fiber.

The penetration of German interests in the textile field follows the over-all pattern of Nazi economic conquest of Europe. In each segment of the European economy—in banking, in heavy industry, in trade, in electric power and light metals—Nazi interests predominate. Those interests bring profits and power to a small clique in Germany which exercises its monopolistic control over Germany's European empire by a system of interlocking directorates, cartelization and other legal methods as well as by outright confiscation of properties from individuals in the conquered nations.

Data in this report were assembled by OWI analysts from reports and economic surveys of other government departments and from materials appearing in the European press and radio.

• APPOINTED ASST. GEN. MANAGER

Paul Mayfield, director of sales of the Naval Stores Department of Hercules Powder Company, has been appointed assistant general manager, A. E. Forster, department general manager, announced recently.

Mr. Mayfield, who joined Hercules in 1926 as a chemist, has served as naval stores director since 1939.

Originally with the company's Cellulose Products Department, he went around the world for Hercules in 1930, specifically investigating Hercules' cellulose products and naval stores possibilities in Australia and New Zealand. He was subsequently transferred to Chicago to supervise the sale of cellulose products, and in 1934, he was appointed manager of the Chicago naval stores branch office. He returned to Wilmington in 1936, as assistant director of sales for the department.

• MEETING, BOARD OF DIRECTORS, T.R.I.

Submission of a progress report on plans for linking the activities of the Textile Research Institute, Inc., with one of the outstanding universities, and unanimous approval of the broad framework for the future of the organization, as set forth in a detailed memorandum recently mailed to its nearly 400 members, featured a meeting of the Institute's Board of Directors held in New York on August 26th.

The action followed a meeting the previous day of the Institute's Technical Research Committee, at which specific research plans were formulated. Several of the projects are important to the war effort, it was reported.

The tie-up between textile research and higher education is still in the tentative stage, but marked progress toward effecting it was announced by Fessenden S. Blanchard, President of the Institute, who presided over the Board meeting. The technical session was directed by William D. Appel, chairman of the Technical Research Committee.

"Textile firms in the 1940's, like the American patriots of the 1770's, must hang together—or they are all too likely to hang separately" is the theme of the memorandum which was endorsed by the directors.

This pamphlet, which is available to all textile men on request, is a preliminary step in connection with the announced program of raising a $2,000,000 fund at the rate of $300,000 a year for a five-year period, plus a capital sum of $500,000.

The present position of the industry must be safeguarded, the pamphlet states, increasing competition must be offset and postwar expansion assured. To secure these the Institute has set out to accomplish five goals: fundamental research in all the major fibers, both natural and synthetic; applied research in each of the major branches of the textile industry; economic research; information service of timely and topical importance; and graduate training in cooperation with a university.

No longer can the textile industry remain near the bottom of the list in research expenditure it is further pointed out, and still look forward with confidence to the future. A recent report of the National Research Council comparing 16 major industries showed that textiles and their products were spending only 6 cents per $100 of value added as against an average for the group of 64 cents.

Such an institute as is being developed will represent the mutual interests of all phases of the industry, it is said, rather than that of any one branch or section. Thus, lines of demarcation among types of mills and fibers can be eliminated, vital consideration under present and prospective postwar conditions.

The pamphlet describes other major advantages of cooperative industry-wide research as follows:

1. By uniting the research facilities of all companies of an industry one industry-wide agency can do a much more comprehensive job than can any one company.

2. Long-range, fundamental research, which seldom yields a quick profit, is a proper function of the central research agency; single companies are loathe to undertake such programs. The fact is that unless a central agency exists to undertake fundamental research, it is usually not done, and the industry suffers.

3. A well-organized, highly-sponsored central agency, especially one affiliated with an outstanding university, will attract the best available scientific brains—to the benefit of the industry as a whole.

4. Such an agency will feed into the industry each year a number of men highly trained in textile chemistry, physics and engineering. These men will do much to meet the industry's need for the most competent technical and managerial brains.

5. Because a comprehensive, industry-wide research program, conducted by well-trained scientists of established reputation, is so obviously "in the public interest", it cannot fail to add to the industry's prestige.

6. Most important of all, the textile industry, through one central research agency, will represent a united front to the growing competition from other industries. The competition which the textile industry is certain to face after the war from the paper, chemical, and plastic fields is already increasingly evident.

The present Board of Directors of the Textile Research Institute consists of W. D. Appel, Chief, Textile Section, National Bureau of Standards; John Bancroft, Jr., President, Joseph Bancroft & Sons Co.; Arthur Besse, President, National Association of Wool Manufacturers; Fessenden S. Blanchard; F. Bonnet, Director, Standards Department, American Viscose Corporation; C. F. Broughton, President Wamsutta Mills; Fuller E. Callaway, Jr., President, Callaway Mills; H. M. Chase, Director of Research, Riverside & Dan River Cotton Mills, Inc.; Earl Constantine, President, National Association of Hosiery Manufacturers; Erb N.

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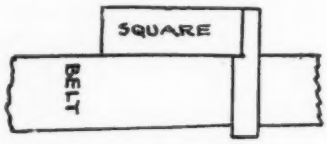
COPY THE MANUFACTURER'S BELT JOINT

W. F. Schaphorst, M.E.

BEFORE making any belt joint it is usually a good plan first to examine carefully the joints already in the belt as made by its manufacturer. Then make your joint as nearly like the manufacturer's joint as possible. By so doing you can be pretty sure that you will make as good a joint as can be made. This applies to all kinds of belts that are at all spliceable by mechanics.

Then, when cutting the belt, the FIRST rule, and a very important one, is to cut the belt SQUARE—at absolute right angles with the outer edges. Always use a square, as indicated in the accompanying sketch. Do the



cutting while the square is in position. Do not attempt to do this most important job with the eye alone. Many valuable belts are ruined annually because this seemingly trivial point is ignored. Its importance can hardly be over-emphasized. Be sure that the operation is properly done.

Every reader knows how easy it is to tear an ordinary sheet of writing paper with one's hands by applying the force to one edge. But when force is distributed over the entire sheet human strength is seldom great enough to pull the sheet apart. The same applies to belts. Unless cut perfectly square, one edge of the belt will be under greater tension than other parts of the belt and the fasteners may pull out. Fabric belts are apt to split down the middle. The belt will also run from side to side on the pulleys and may run off frequently. All of this trouble is often due to the "trivial" fact that the belt was not cut square.

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WAR BONDS
Are to **WIN!**

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The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $6.25 per column inch or less per insertion.

POSITION WANTED: As manager, assistant manager or technical advisor in moderate size finishing plant; familiar with all departmental angles as well as requirements of trade. Fully familiar with quartermaster requirements. Complete references. Above draft age. Write Box No. 466, American Dyestuff Reporter, 440 Fourth Ave., New York, 16, N. Y.

WANTED: Graduate Chemist with dyehouse experience for development work in large dyehouse. Applicant must not be engaged in war work and must have sanction of the local War Manpower Commission. Write Box 469, American Dyestuff Reporter, 440 Fourth Ave., New York 16, N. Y.

WANTED: Graduate Engineer to serve as assistant engineer in large dyehouse. Work consists principally of maintenance of equipment. Several years' experience in this line desirable. Permanent opening. Applicant must not be engaged in war work and must have sanction of the local War Manpower Commission. Write Box No. 470, American Dyestuff Reporter, 440 Fourth Ave., New York 16, N. Y.

WANTED: WOMAN CHEMIST—WHO CAN WRITE: Immediate opening for technically trained, preferably chemical and textile background, college graduate who can translate technical research reports into clear, concise, helpful letters to salesmen and customers. Opportunity for advancement and responsibility in new department of well established company—New England location—salary open. Write stating qualifications, technical training and salary expected. Box No. 471, American Dyestuff Reporter, 440 Fourth Ave., New York 16, N. Y.

WANTED: Wool and cotton dyer by rug company. Experienced on yarn or piece goods. State experience and salary desired. Write Box No. 472, American Dyestuff Reporter, 440 Fourth Ave., New York 16, N. Y.

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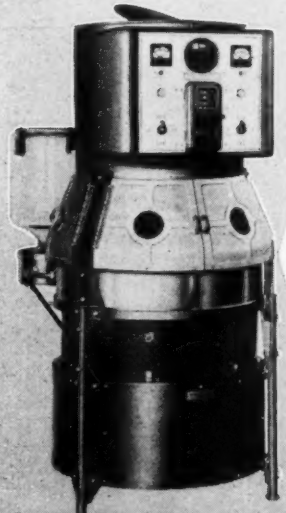

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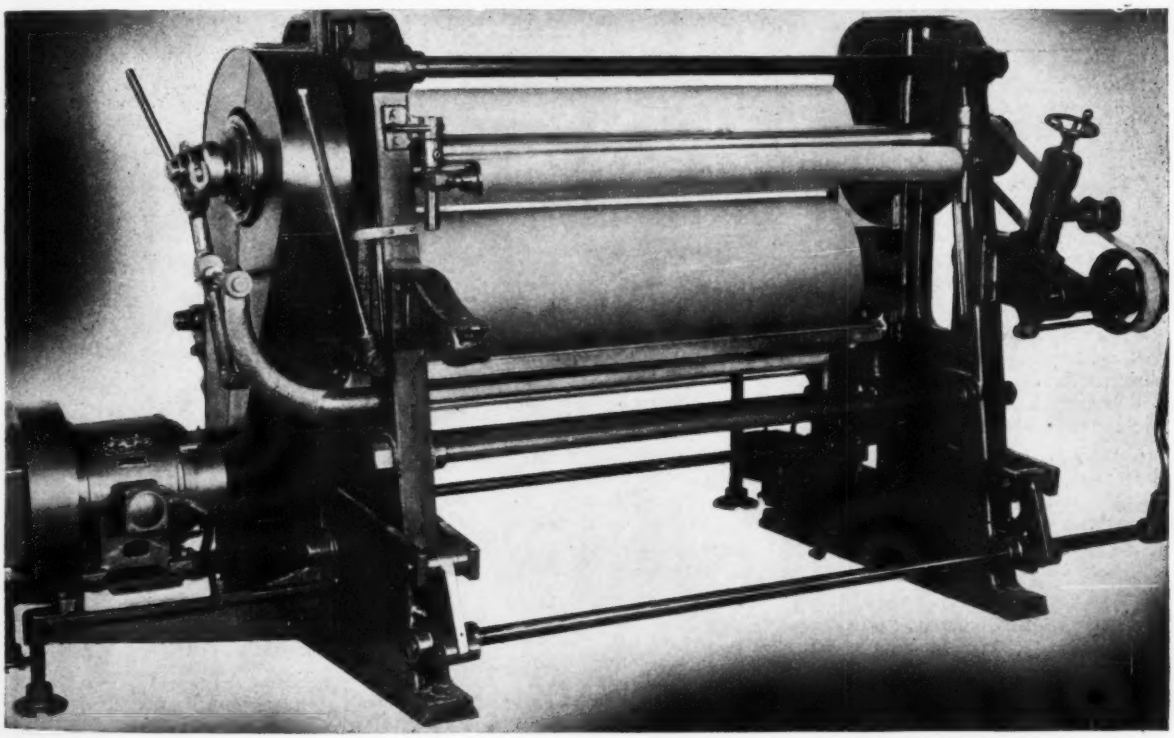

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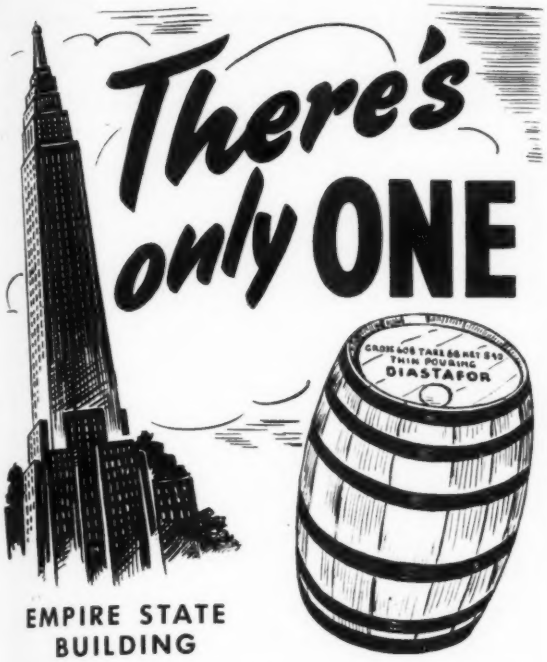

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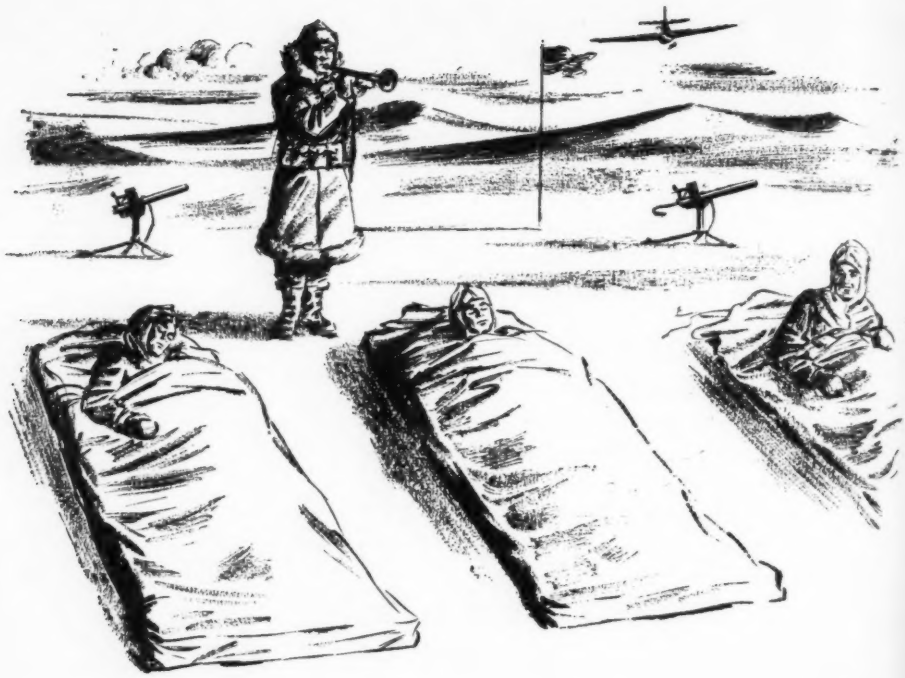

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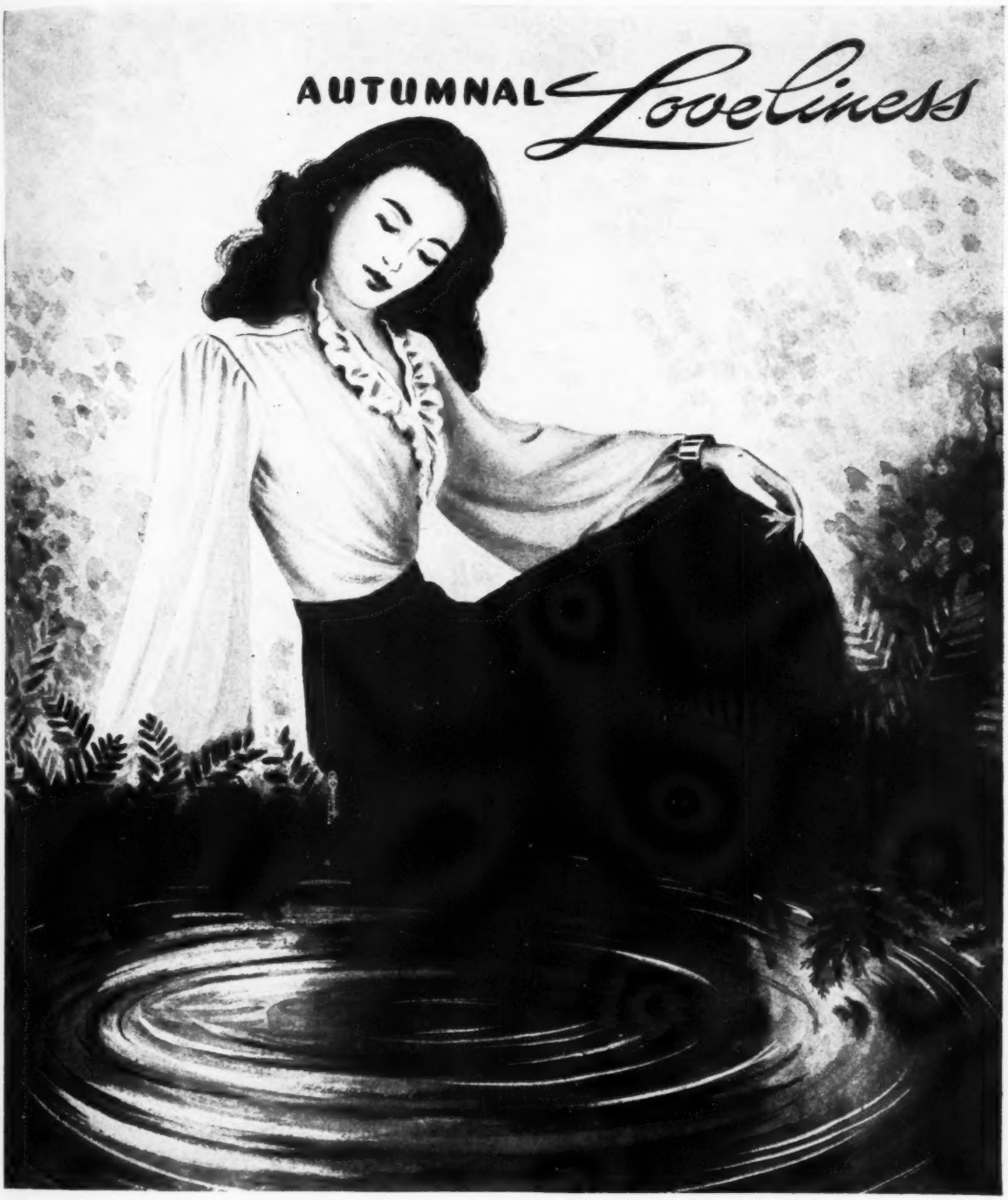

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